

Research on South African Culicini (Diptera, Culicidae).

III. — A check-list of the species and their distribution, with notes
on taxonomy, bionomics and identification.

by

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Introduction.

A large part of the data set out in this paper has been amassed by the writer during investigations occupying the last four or five years. This has been financed by senior bursary grants from the South African Council for Scientific and Industrial Research (see also Muspratt, 1953 a and b).

Owing to many earlier difficulties in change in nomenclature, synonymy, and mis-identifications, the published distribution records are mostly quoted from Edwards (1941) and later authors. Any before 1941, which were omitted by Edwards, have only been included when it has been possible to confirm them from specimens still in the collection of this Institute or if there appears to be no doubt about them. For reference, however, a list of publications relating to previous culicine research surveys is given below (see also Edwards, 1941, p. 466 and Bedford, 1928, p. 884), but this does not include papers at present in the press.

The localities have been grouped under published and hitherto unpublished records and listed from north to south for each territory or province. The scope has been widened to include records from South West Africa and the Protectorates of Bechuanaland, Swaziland and Basutoland, but the writer's investigations have mostly been confined to the Union of South Africa. The latter records, if not published before are indicated by the letters C.S.I.R. In the published records the author is given in brackets, but the collector or other reference for the unpublished records. An asterisk denotes those species for which there are no reliable previously published records for the Union of South Africa, although in some cases these are not recent discoveries. For the very common species the localities are not listed, but the distribution is discussed in general terms. Only a few of the more important records have been noted from collections made during the last few years, which have not been amalgamated with that of the Institute, as it is expected these collections will be recorded separately.

As regards my own identifications, when female specimens have no clear markings or other distinguishing features, and for accurate determinations the male terminalia must be used, these male records only are considered to be valid. Determinations occasionally made from larvae, or their pelts, are included only if the larva is very clearly distinguishable from all others.

The sub-genus *Stegomyia* has been dealt with fully elsewhere (Muspratt, 1956, in the press), therefore in this paper there is merely a list of species.

The classification and taxonomy followed is that of the monograph *Mosquitoes of the Ethiopian region* parts 1 and 3 (Hopkins, 1952, revised edition, and Edwards, 1941). These works should be consulted in conjunction with this paper. At the present time in South Africa, and the neighbouring territories included here, there is a known total of 122 culicine species and one *Toxorhynchites*; these are divided into ten genera as follows:-

<i>Toxorhynchites</i> . . . 1.	<i>Ficalbia</i> 5 (in 2 sub-genera).
<i>Harpagomyia</i> . . . 1.	<i>Taeniorhynchus</i> . . 8 (in 2 sub-genera).
<i>Uranotaenia</i> . . . 9.	<i>Aedes</i> 59 (in 8 sub-genera).
<i>Aedomyia</i> 1.	<i>Eretmapodites</i> . . . 3
<i>Theobaldia</i> . . . 1.	<i>Culex</i> 35 (in 5 sub-genera).

In addition to the above there is an un-described species of the genus *Orthopodomyia*.

Publications on previous surveys.

South Africa. Only the general surveys cover an extensive area.

General: Ingram and De Meillon (1927 and 1929): northern and eastern Transvaal and northern Natal, particularly the coastal belt of the latter. Bedford (1928): all available records for the Union.

Local: Theobald (1903, 1911 and 1912): collections made at Pretoria and Onderstepoort (Tvl.) by Theiler and others. Bostock (in Ross, 1911): eastern Transvaal, mostly Nelspruit district. Pratt-Johnson (1921): Capetown, Durban, Potchefstroom, and near Pretoria. Edwards (1924): Cape. De Meillon (1928): Johannesburg and district. Nieschulz, Bedford and du Toit (1934b): Onderstepoort. De Meillon (1935): Cape Province.

S. W. Africa. Edwards (1924): a small collection of Barnard from Ovambo-land. De Meillon and Hardy (1953): collection from wide area (malaria survey), particularly northern half.

Bechuanaland Protectorate. De Meillon (1947): survey of northern part of territory.

Swaziland and Basutoland: small collections only (see records in text).

Alphabetical check-list of the genera, sub-genera and species.

- Aedes* (*Aëdimorphus*): *albocephalus* Theo. p. 166, p. 200., *alboventralis* Theo. p. 167, p. 200., *argenteopunctatus* Theo. p. 164, 199., *bedfordi* Edw. p. 165, p. 199., *bevisi* Edw. p. 168, p. 200., *capensis* Edw. p. 163, p. 196., *cumminsi* Theo. p. 168, p. 200., *dentatus* Theo. p. 167, p. 200., *durbanensis* Theo. p. 173, p. 193., *eritreae* Lewis p. 166, p. 200., *filicis* Ingr. & De M. p. 165, p. 199., *fowleri* d'Emm. p. 172, p. 193., *haworthi* Edw. p. 164, p. 196., *hirsutus* Theo. p. 172, p. 193., *lamborni* Edw. p. 167, p. 195., *leesoni* Edw. p. 167, p. 200., *marshalli* Theo. p. 163, p. 196., *microstictus* Edw. p. 165, p. 199., *minutus* Theo. p. 166, p. 199., *mixtus* Edw. p. 164, p. 199., *ochraceus* Theo. p. 173, p. 197., *pachyurus* Edw. p. 168, p. 200., *quasininnittatus* Theo. p. 167, p. 200., *subdentatus* Edw. p. 168, p. 200., *vexans* Mg. p. 169, p. 196.
- Aedes* (*Banksinella*): *albothorax* Theo. p. 174, p. 198., *circumluteolus* Theo. p. 173, p. 198., *lineatopennis* Ludl. p. 173, p. 198., *luteolateralis* Theo. p. 174, p. 198.
- Aedes* (*Diceromyia*): *adersi* Edw. p. 175, p. 193., *fascipalpis* Edw. p. 175, p. 195., *furcifer* Edw. p. 174, p. 192., *taylori* Edw. p. 175, p. 192.
- Aedes* (*Dunnius*): *natalensis* Edw. p. 176, p. 198.
- Aedes* (*Finlaya*): *barnardi* Edw. p. 162, p. 195., *fulgens* Edw. p. 162, p. 195., *nyasae* Edw. p. 162, p. 195.
- Aedes* (*Mucidus*): ? *mucidus* Karsch p. 160, p. 194., *scatophagoides* Theo. p. 159, p. 194.
- Aedes* (*Ochlerotatus*): *breedensis* Mus. p. 162, p. 193., *caballus* Theo. p. 160, p. 193., *harrisoni* Mus. p. 161, p. 193.
- Aedes* (*Stegomyia*) p. 195., *aegypti* L. p. 163, *amaltheus* De M. & Lavp. p. 163., *calceatus* Edw. p. 163., *contiguus* Edw. p. 163., *demeilloni* Edw. p. 163., *dendrophilus* Edw. p. 163., *heischi* van Som. p. 163., *luteocephalus* Newst. p. 163., *metallicus* Edw. p. 163., *poweri* Theo. p. 163., *pseudonigeria* Theo. p. 163., *simpsoni* Theo. p. 163., *soleatus* Edw. p. 163., *streliziae* Mus. p. 163., *subargenteus* Edw. p. 163., *unilineatus* Theo. p. 163., *vittatus* Big. p. 163.
- Aedomyia* *furfurea* End. p. 155, p. 192.
- Culex* (*Culex*): *andersoni* ssp. *bwambanus* Edw. p. 188, p. 202., *annulioris* Theo. p. 182, p. 192., *antennatus* Beck. p. 189, p. 201., *argenteopunctatus* ssp. *kingi* Theo. p. 183, p. 199., *aurantapex* Edw. p. 182, p. 192., *chorleyi* Edw. p. 189, p. 202., *decens* Theo. p. 190, p. 201., *duttoni* Theo. p. 183, p. 195., *ethiopicus* Edw. p. 182, p. 192., *fatigans* Wied. p. 187, p. 202., *pipiens* L. p. 187, p. 202., *poicilipes* Theo. p. 181, p. 192., *simpsoni* Theo. p. 185, p. 202., *striatipes* ssp. *joanae* nov. p. 185, p. 198, p. 202., *terzii* Edw. p. 186, p. 202., ? *thalassius* Theo. p. 191, *theileri* Theo. p. 183, p. 198., *toroensis* Edw. & G. p. 189, p. 202., *trifiliatus* Edw. p. 188, p. 202., *trifoliatus* Edw. p. 190, p. 201, p. 202., *univittatus* Theo. p. 184,

- p. 198., *vansomereni* ssp. *draconis* I. & De M. p. 189, p. 202., *zombaensis* Theo. p. 188, p. 202.
- Culex (Culiciomyia): cinerellus* Edw. p. 180, p. 201., *nebulosus* Theo. var. *pseudocinereus* Theo. p. 180, p. 201.
- Culex (Lutzia) tigripes* Grp. & C. p. 177, p. 194.
- Culex (Mochthogenes): inconspicuus* Theo. p. 181, p. 201., *simpliciforceps* Edw. p. 181, p. 201.
- Culex (Neoculex): avianus* De M. p. 177, p. 200., *horridus* Edw. p. 179, p. 201., *insignis* Cart. p. 179, p. 201., *péringueyi* Edw. p. 178, p. 200., *pulchrithorax* Edw. p. 177, p. 197, p. 200., *rima* Theo. p. 179, p. 201., *rubinotus* Theo. p. 179, p. 201., *salisburyensis* Theo. p. 178, p. 201., sp. indet. p. 180.
- Eretmapodites: quinquevittatus* Theo p. 176, p. 197., *silvestris* I. & De M. p. 176, p. 197., *subsimplicipes* Edw. p. 176, p. 197.
- Ficalbia (Etorleptomyia) mediolineata* Theo. p. 157, p. 195.
- Ficalbia (Mimomyia): hispida* Theo. p. 156, p. 200., *lacustris* Edw. p. 156, p. 200., *mimomyiaformis* Newst. p. 156, p. 197., *plumosa* Theo p. 156, p. 196.
- Harpagomyia taeniarostris* Theo. p. 153, p. 199.
- Orthopodomyia* sp. p. 156, p. 194.
- Taeniorhynchus (Coquillettia): aureus* Edw. p. 158, p. 194., *juscopennatus* Theo. p. 157, p. 194., *maculipennis* Theo. p. 157, p. 194., *metallicus* Theo. p. 157, p. 197., *microannulatus* Theo. p. 158, p. 194., *wahlbergi* Edw. p. 158, p. 194.
- Taeniorhynchus (Mansonioides): africanus* Theo. p. 158, p. 193., *uniformis* Theo. p. 159, p. 193.
- Theobaldia longiareolata* Macq. p. 155, p. 193.
- Toxorhynchites brevipalpis* Theo. p. 153, p. 194.
- Uranotaenia: alba* Theo. p. 154, p. 199., *balfouri* Theo. p. 154, p. 199., *bilineata* var. *fraseri* Edw. p. 154, p. 196., *candidipes* Edw. p. 154, p. 196., *chorleyi* Edw. p. 154, p. 199., *fusca* Theo. p. 154, p. 201., *mashonaensis* Theo. p. 154, p. 199, p. 201., *montana* I. & De M. p. 154, p. 196., *nigromaculata* Edw. p. 154, p. 199.

Abbreviations.

- A = abundant in most localities except the very arid regions.
- C = widely distributed and common in some districts.
- CR = restricted to the coastal zone, certain parts of the country, or certain habitats, where it is sometimes common.
- R = rare.
- (Above letters applicable to the Union of South Africa only).

t = breeding in tree holes.

a = „ „ plant axils.

u = „ „ artificial containers or utensils, tanks, tins, bottles etc.

p = „ „ pools, streams, swamps, dams, troughs, crab holes etc.

Note: the abbreviations for breeding places are put in order of preference if there are more than one after any species.

Toxorhynchites brevipalpis Theobald, 1901. (CR; a,t,u).

The genus *Toxorhynchites* was formerly known by the pre-occupied name *Megarhinus* Robineau-Desvoidy (see Stone, 1948).

Taxonomy. Adults. There is considerable variation in the coloration of the scales on the vertex, anterior pronotal (*apn.*), posterior pronotal (*ppn.*) and the broad margin of the scutum, including the scutellum. These areas are usually light or dark blue, or greenish; but on some specimens from Natal, and all from the Transvaal, they are pale buff with bronzy or golden sheen in parts. Variation in the colour of the supra-alar and scutellar bristles has been noted by van Someren (1946).

Bionomics. The laboratory breeding and general bionomics of this species have been dealt with in a full length paper (Muspratt, 1951), and further interesting information has been added by Bonnet and Hu (1951) when it was specially introduced into Hawaii from South Africa, for use in the biological control of certain *Aedes*. On the coast of Natal the larvae are found mostly in the leaf axils of *Strelitzia Nicolai* Regel and Koch, in which they prey on those of *Aedes* (*Stegomyia*) *strelitziae* Mus., but it also breeds in tree holes and sometimes in discarded tins or other vessels.

Distribution. There are records from only four localities in the Transvaal, but it is common on the coastal belt of Natal and has been found at two places on the coast of the Transkei, and in a montane forest of the Amatola Mountains (Cape Province). TRANSVAAL: *un-published*: Magoeba's Kloof (C.S.I.R., 1953), New Agatha (De Meillon, 1934), Bushbuckridge (Steynberg, 1948), Barclay Vale (Nelspruit district) (C.S.I.R., 1954). CAPE PROVINCE: *published*: Port St. Johns (Edwards, 1941, p. 27), Embotyi and Kologha Forest (nr. Stutterheim) (C.S.I.R., 1951, determined from a larva). NATAL: *published*: Eshowe (Ingram and De Meillon, 1927, p. 44), Durban (Edwards, 1941, p. 27), Margate (Muspratt, 1951); *un-published*: Dukuduku Forest and St. Lucia (C.S.I.R., 1952), Salt Rock (C.S.I.R., 1952), Isipingo (Steyn, 1950), Amanzimtoti, Renishaw (nr. Scottburgh), Umtentweni and South Broom (C.S.I.R., 1950—1951).

Harpagomyia taeniarostris Theobald, 1911. (R; a).

Bionomics. The manner in which adults of this genus obtain food from ants is noted by Edwards (1941, p. 35). The only known breeding places of *taeniarostris* in South Africa are the leaf axils of *Bilbergia mutans* and an arum lily (Ingram and De Meillon, 1927, p. 78, under *H. trichorostris*).

Distribution. This is only known from two adjacent localities in Zululand, but a larva of the genus has been collected at Tzanecn (Transvaal) (Ingram and De Meillon, 1929, p. 114). NATAL: *published*: Empangeni (Ingram and De Meillon, 1927, pp. 42 and 78); *un-published*: Richard's Bay (De Meillon, 1935).

Uranotaenia alba Theobald, 1901. (R; p.).

Distribution. TRANSVAAL: *published*: northern district (Elim Hospital) (Edwards, 1941, p. 49).

Uranotaenia bilineata var. **fraseri** Edwards, 1912. (R; p.).

Distribution. NATAL: *published*: Umfolosi (Zululand) (Edwards, 1941, p. 51).

Uranotaenia balfouri Theobald, 1905. (R; p.).

Distribution. S. W. AFRICA *published*: Ondangwa (De Meillon and Hardy, 1953, p. 32).

***Uranotaenia chorleyi** Edwards, 1936 (R; p.).

Distribution. NATAL: *un-published*: Eshowe (Zululand) (De Meillon, 1935).

Uranotaenia montana Ingram and De Meillon, 1927. (R; p.).

Distribution. TRANSVAAL: *published*: Johannesburg (De Meillon *et. al.* 1945 p. 100); *un-published*: White River district (C.S.I.R., 1954). CAPE PROVINCE: *un-published*: Embotyi (C.S.I.R., 1951). NATAL: *published*: Eshowe, and in a train between Matubatuba and Gingindhlovu (Ingram and De Meillon, 1927, p. 81, Edwards, 1941, p. 55); *un-published*: Port Shepstone (C.S.I.R., 1951).

Uranotaenia candidipes Edwards, 1912. (R; p.).

Distribution. TRANSVAAL: *published*: Mokeetsi, Potgietersrust, Onderstepoort (Edwards, 1941 p. 56).

Uranotaenia mashonaensis Theobald, 1901. (R; p.).

Distribution. NATAL: *published*: Eshowe and Felixton (Ingram and De Meillon, 1927, pp. 43 and 44). CAPE PROVINCE: *un-published*: Kirstenbosch (nr. Cape Town) (C.S.I.R., 1951).

Uranotaenia nigromaculata Edwards, 1941 (= **U. bimaculata** Theobald, 1910). (R; p.).

Distribution. TRANSVAAL: *un-published*: Johannesburg (De Meillon, 1926). NATAL: *published*: Eshowe (De Meillon, 1943, p. 100); *un-published*: St. Lucia (De Meillon, 1937).

Uranotaenia fusca Theobald, 1907. (R; p.).

Distribution. TRANSVAAL: *published*: locality unknown (Edwards, 1941 p. 62).

**Aëdomyia furfurea* Enderlein, 1923. (R; p).

Taxonomy. *Adult.* — A male from Zululand has a rather irregular sub-basal white band on the proboscis like *africana*, but some specimens from Livingstone, N. Rhodesia, also have this. *Larva.* — Head setae A and B of the associated larval pelt of this male, have rather fewer branches than normal (Hopkins, 1952, p. 76) and the sub-ventral tuft of the siphon has only 2 branches instead of about 6.

Distribution. BECHUANALAND: *un-published*: Seronga (De Meillon 1949). NATAL: *un-published*: St. Lucia (Zululand) (Muspratt, 1942).

Theobaldia longiareolata Macquart, 1938. (C; p).

There would appear to be little variation in specimens from different parts of Southern Africa (see Edwards, 1941, p. 69).

Bionomics. This species would appear to be highly resistant to drought as it is common throughout the western part of the South-west Arid District of the Ethiopian region (Edwards, 1941, p. 452). It breeds in veld and river-bed pools including rock pools, and the writer found it to be the predominant species at Springbok in Namaqualand at the beginning of the short rainy season. In the Orange River Valley of the northern Cape Province it seems to breed chiefly in pools in the river valley during the winter months, and from there probably spreads to the surrounding Karroo country during the limited rainfall. Larvae are also found in water tanks and in cattle and sheep troughs, which may help to maintain the species in some arid districts; other breeding places are given by Hopkins (1952, p. 78). The eggs of this genus are apparently not resistant to desiccation. The adult females seldom attack man (Lewis, 1943).

Distribution. The species has a very wide distribution throughout South Africa and the neighbouring territories considered here. It is abundant on parts of the High Veld, particularly in the more arid regions, and is found as far south as Cape Town. S.W. AFRICA: There are several records from the northern part and in the vicinity of Windhoek. In the southern part it is known as far south as Warmbaths near the Orange River. BECHUANALAND: *published*: Basinghall (Ingram and De Meillon, 1927, p. 17); *un-published*: Notwani River nr. Ramoutsa (S.A.R. & H.). TRANSVAAL: There are several records for the southern part of the province, including the vicinity of Johannesburg and Pretoria, but it appears to be rare or absent in the northern part. CAPE PROVINCE: It is widespread over the greater part of the western and northern province including the Karroo and Namaqualand, and is common in the south west. It is, however, rather rare on most of the coastal belt and in the Transkei, where there are only two un-published records from Umtata (De Meillon, 1943) and Bizana (Steyn, 1950). ORANGE FREE STATE: *published*: Kroonstad (Edwards, 1941, p. 69); *un-published*: recent collecting indicates that the species is fairly widespread (Schulz un-published report 1952). BASUTOLAND: *un-published*: Mamathes (Jacot Guillarmod, 1947). NATAL: *published*: Estcourt and Weenen (Edwards,

1941, p. 69); *un-published*: Melmoth (Bayer, 1935), Cathedral Peak district (De Meillon, 1942).

***Orthopodomyia** sp. (R; t).

A possibly new species of this genus has been collected by Mr. K. H. Schulz at Satara Camp in the Kruger National Park. The only adult is unfortunately rather damaged and it is not certain if the larvae, collected at the same place, belong to it, although it is very probably the case. It is a new record for this genus in the Ethiopian region of Africa, although one species occurs in Mauritius and three in Madagascar.

Ficalbia (Mimomyia) hispida Theobald, 1910. (R; p).

Taxonomy. Adult. — see *lacustris* (below).

Distribution. TRANSVAAL: *published*: Tomango (nr. Nelspruit) (Edwards, 1941, p. 78).

***Ficalbia (Mimomyia) lacustris** Edwards, 1935. (R; p).

Identification and Taxonomy. Adult. — A single female specimen of the *F. hispida* group is nearest to *lacustris*, having a very dark scutal integument with black scales, and brownish pleurae. The abdominal tergites have a small median pale patch on segment 2 and very small median pale spots on 3—6 in addition to the lateral pale patches, like some *hispida* the front and middle tibiae are pale posteriorly and the hind tibia pale on the inner side. The first hind tarsal segment of both this specimen and one or two (but not all) of *hispida* from other parts of Africa, which I have measured, are as long or slightly longer than the hind tibiae; this is at variance with the generic character noted by Edwards (1941, p. 73).

Distribution. NATAL: Empangeni (Zululand) (Ingram and De Meillon, 1927, p. 42, as *Culex aurantapex*).

Ficalbia (Mimomyia) mimomyiaformis Newstead, 1907. (R; p).

Distribution. S.W. AFRICA: *published*: Namutoni, Ondangua (De Meillon and Hardy, 1953, p. 32). TRANSVAAL: *published*: Tzaneen (Edwards, 1941, p. 82). SWAZILAND: *un-published*: Lomati River (nr. Horo) (Mastbaum, 1942).

Ficalbia (Mimomyia) plumosa Theobald, 1901. (R; p).

Taxonomy. Adults. — Specimens from S. W. A. have a very variable amount of white on the apical half of the third segment of the hind legs. On none is this segment as much as half white, as the normal form; most have only a quarter or less white, and on one or two it is all dark. On one specimen it is all dark and also half of the fourth segment. On most specimens the fifth tarsal segments of the fore and middle legs are not pale, and the males have a narrowish pale band in the middle of the proboscis.

Distribution. S. W. AFRICA: *published*: Ondangua (De Meillon and Hardy, 1953, p. 32).

Ficalbia (Etorleptomyia) mediolineata Theobald, 1904. (R; p).

Taxonomy. Adults. — On the abdominal tergites of specimens from S. W. Africa and Bechuanaland Protectorate there are two lateral yellowish patches on segments 2—7 in addition to the median pale band. One of these patches is basal and removed from the lateral edge and the other is apical and nearer the edge. They are joined together on segments 5—7 on one specimen. Newstead (1907, p. 33) only mentions these patches on the apical segment of *quadrimaculata*, and it is not clear whether Edwards (1941, p. 84.) is referring to one or two patches. Another difference in these specimens from the description of Edwards (1941, p. 85) is that the stem of the upper forkcells has mostly dark scales.

Distribution. S. W. AFRICA: *published*: Ondangua (De Meillon and Hardy 1953, p. 32). BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *published*: unknown locality (Edwards, 1941, p. 85).

Taeniorhynchus (Coquillettidia) metallicus Theobald, 1901. (R; p).

Distribution. BECHUANALAND: *published*: locality unknown (Edwards, 1941, p. 92). NATAL: *published* Durban (Edwards, *loc. cit.*).

Taeniorhynchus (Coquillettidia) maculipennis Theobald, 1911. (R; p).

Taxonomy. Adults. One or two specimens from the South Coast of Natal have the lower half of the sternopleura somewhat darkened like *T. annetti*.

Distribution. TRANSVAAL: *published*: Tzaneen (Edwards, 1941, p. 95). NATAL: *un-published*: St. Lucia and Eshowe (Zululand) (Meeser, 1937), Amanzimtoti (C.S.I.R. 1950).

Taeniorhynchus (Coquillettidia) fuscopennatus Theobald, 1903. (R; p).

Identification and Taxonomy. Adults. — A re-examination of the terminalia of two males from the collection of Ingram and De Meillon which were collected in Zululand and attributed to this species, reveals that they are *T. wahlbergi*. In view of the fact that the latter species was not distinguished until 1936, the Natal records of Ingram and De Meillon (1927, pp. 42 and 43) and of Bedford (1928, p. 958) must be regarded as doubtful. The latter author does not mention any brownish pigmentation of the thoracic integument and his note that there is a dark band in the middle of the hind femora can only refer to the hind tibiae, possibly of *wahlbergi* or *aureus*. The terminalia and ornamentation of a male from the Transvaal recorded by Ingram and De Meillon (1929, p. 149) are, however, quite typical.

Bionomics. Haddow *et. al.* (1951, p. 216) note the species bites monkeys, dogs and fowls as well as man; it is chiefly nocturnal in its biting habit (Haddow *et. al.* 1947).

Distribution. TRANSVAAL: *published*: Warmbaths (Ingram and De Meillon 1929, *loc. cit.*); *un-published*: Bapsfontein, (Benoni district) (Paterson, 1954).

Other records from the Transvaal and Natal require confirmation from male terminalia.

Taeniorhynchus (Coquillettia) aureus Edwards, 1915. (R; p).

Identification. Adults. — It seems doubtful if the females can always be distinguished from those of *wahlbergi* with certainty.

Distribution: The following records are from male terminalia. TRANSVAAL: *published:* Nelspruit and Krokodilpoort (near Crocodile River) (Ingram and De Meillon, 1929, pp. 100 and 102.); *un-published:* Naboomspruit district (Zumpt, 1949), Nylstroom (Steyn, 1954). NATAL: *published:* Durban (Edwards, 1941, p. 100).

Taeniorhynchus (Coquillettia) wahlbergi Edwards, 1936. (R; p).

Identification. Adults. — See *T. fuscopennatus* and *T. aureus* above.

Distribution. CAPE PROVINCE: *published:* "Caffraria" (i.e. an unknown locality in the eastern districts (Edwards, 1941, p. 101)). NATAL: *published:* Empangeni and Felixton (Ingram and De Meillon, 1927, pp. 42 and 43, as *fuscopennatus*); *un-published:* St. Lucia (Zululand) (Meeser, 1937).

Taeniorhynchus (Coquillettia) microannulatus Theobald, 1911. (R; p).

Identification and Taxonomy. Adults. — This species, and its variety, are not likely to be confused with other yellow species on account of there being no black band in the middle of the hind tibia. A female from Wynberg has rather dark wings and the second and third segments of the abdominal tergites are extensively covered with dark scales (see also Pereira, 1946, p. 370; Haddow *et. al.* 1951, p. 216); also the hind tarsal segments are broadly dark distally.

Distribution: — (var. = var. *auripennis* Edw.). CAPE PROVINCE: Bergvliet, (near Cape Town) and Wynberg (Harrison, 1952 and 1953). NATAL: *published:* Empangeni and Felixton (Ingram and De Meillon, 1927, pp. 42 and 43, as *chubbi*) (var.); Durban (Edwards, 1941, p. 101); *un-published:* Reunion airport (Steyn, 1950) (var.), Isipingo Beach (Woodiwiss, 1946) (var.).

Taeniorhynchus (Mansonioides) africanus Theobald, 1901. (CR; p).

Identification. Adults. — Although the marking of the hind femora and tibiae may serve to distinguish this species from *uniformis*, I have found it to be advisable to check doubtful female specimens by examination of the eighth sternite (Edwards, 1941, p. 104).

Bionomics. Females are vicious biters, particularly at night near the ground when taken in forest (Mattingly, 1949a, pp. 164—166), but it also frequents the canopy (Haddow *et. al.* 1947, p. 314). The species is a proved laboratory carrier of yellow fever (Philip, 1930). Lewis (1947) had grounds for suspecting it as a possible vector in the Sudan, but Lumsden and others

(Lumsden, 1954) did not consider *Taeniorhynchus* spp., including *africanus*, to be vectors in nature in East Africa.

Distribution. S. W. AFRICA: *un-published*: Ondangua (Schettler, 1934). BECHUANALAND: *published*: Lake Ngami (Edwards, 1941, p. 105); *un-published*: Kasane, Muhembo, Shakawe, Gomare, Maun (De Meillon, 1946). TRANSVAAL: *published*: Onderstepoort (Edwards, 1941, p. 105). NATAL: *published*: Manyana, Empangeni (Edwards, 1941, p. 105). Felixton (Ingram and De Meillon, 1927, p. 43); *un-published*: St. Lucia (C.S.I.R., 1952), Umfolosi River, (Ingram and De Meillon, 1927), Isipingo nr. Durban (De Meillon, 1945).

NOTE: De Meillon (1954)* points out that the species has been much reduced in South Africa on account of the drainage of swamps.

Taeniorhynchus (Mansonioides) uniformis Theobald, 1901. (CR; p).

Identification. Adults. — See *africanus* above.

Bionomics. It is probably similar in most respects to *africanus*, but there is less information with regard to this on account of it being rarer in those territories where investigations have been carried out. It is not a laboratory carrier of yellow fever (Kerr, 1932). For breeding place etc. see Hopkins (1952, pp. 102 and 111).

Distribution. BECHUANALAND: *published*: Lake Ngami (Edwards, 1941, p. 106); *un-published*: Kasane, Muhembo, Shakawe, Seronga, Nokanen, Maun and district (De Meillon, 1946), Xwe or Boajankwe (Toakhe River, Okavango) (Davis, 1944). TRANSVAAL: *published*: Onderstepoort (Edwards, 1941, p. 106); *un-published*: Potgietersrust (De Meillon, 1941), Naboomspruit (C.S.I.R., 1954). NATAL: *published*: Umfolosi and Empangeni (Ingram and De Meillon, 1927, pp. 41 and 42), Durban (Edwards, 1941, p. 106); *un-published*: St. Lucia (C.S.I.R., 1952), Isipingo and district, (De Meillon, 1945), Amanzimtoti (C.S.I.R., 1950).

Aedes (Mucidus) scatophagoides Theobald, 1901. (CR; p).

Identification. Adults. — Edwards (1941, p. 112) does not include the Natal records of Bedford (1928, p. 933), I can see no reason for omitting these, as Bedford's description of the species is perfectly correct; the absence of white basal bands on the last two segments of the fore and mid tarsi being normal variation in southern Africa.

Distribution. S. W. AFRICA: *un-published*: Ondangua (Schettler, 1934), Okakarara, Omatjette, Epukiro, Gobabis (De Meillon, 1950). TRANSVAAL: *published*: Onderstepoort (Bedford, 1928, p. 933,? Edwards, 1941, p. 112). *un-published*: Tzaneen (De Meillon, 1931), Pienaar's River siding (C.S.I.R., 1953), Pretoria (Murray, 1941). NATAL: *published*: Umfolosi river, nr. Empangeni (Zululand) and Umbilo (nr. Durban) (Bedford, 1928, p. 933); *un-published*: Nyezane (Zululand) (De Meillon 1935).

* Bull. World Hlth. Org., 11, pp. 443-451.

NOTE: a species of this genus occurs as far south as Port St. Johns (E. Cape Province), but a larval pelt is the only known specimen (C.S.I.R., 1952).

***Aëdes (Mucidus)? mucidus* Karsch, 1887. (R; p).**

Identification. Adults. — It is doubtful if this species really occurs in South Africa, as the only record dates back to 1857 (Edwards, 1941, p. 113). There certainly is another species besides *A. scatophagoides*, but it is not identical to *mucidus* and the male terminalia place it nearer to *nigerrimus*; it is probably a new species or sub-species. Specimens have been sent to the British Museum, as Edwards (1911, p. 246) refers to a specimen from Natal as a possible variety of *mucidus*, which may also belong to this species.

Distribution. NATAL: *published*: Durban (Edwards, 1941, p. 113.); *unpublished*: St. Lucia (Zululand) (Muspratt, 1942), Illovo Beach (South Coast) (Paterson, 1954).

***Aëdes (Ochlerotatus) caballus* Theobald, 1912. (C; p).**

Taxonomy. Adults. — *Wings*: The variation in wing markings, particularly of the female specimens from South Africa would appear to fall into three groups: 1. A fairly heavy sprinkling of pale scales on all veins including the costa. 2. Wing predominantly dark, with a few pale scales on the sub-costa and first vein. 3. Wing entirely dark with only a short line of pale scales at the base of the costa.

Edwards (1941, p. 118) remarks on the first two of these variations, but a specimen, examined by me, which was collected by Ingram on the Vaal River, and identified by Edwards, seems to fall into group 3, as the pale scaling is confined to the base of the costa.

Legs: On the last tarsal segments of the hind legs there are usually broad basal white bands on segments 2 and 3 and a basal band on the fourth; also sometimes an indication of a narrow band on the fifth. Alternatively the bands on 2 and 3 may be narrower and both 4 and 5 dark.

Nearly all the females I have examined have wings of group 3 and tarsi with a basal band on segment 4. These are from the following localities: TRANSVAAL: *unpublished*: Johannesburg (Muspratt, 1949). CAPE PROVINCE: *unpublished*: Worcester, Port Alfred and Groot Rivier Mouth (Nature's Valley) (C.S.I.R., 1951—1952). ORANGE FREE STATE: *published*: Vaal River Barrage (Edwards, 1941, p. 118); *unpublished*: Brandfort (C.S.I.R. 1954). BASUTOLAND: *unpublished*: Mamathes (Jacot Guillarmod, 1947).

There is only one female with wings sprinkled with pale scales and a dark fourth hind tarsal segment; locality: CAPE PROVINCE: *unpublished*: Colesberg (C.S.I.R., 1954). I have not, however, seen any female specimens from Natal.

Bionomics. A study of this species has been intensified since it became known that it is a vector of Rift Valley fever in South Africa and can transmit the disease by bite (Ann. Rep. S. A. Inst. Med. Res. for 1953, pp. 45 and 54).

A short account of the disease in Africa with references to the more detailed literature is in the press (Muspratt, 1956).

The species breeds in small or large temporary pools or pans, particularly those in certain areas of the High Veld. In some cases these pools are brackish, but the writer has found only a few larvae in sea water seepage pools in the coastal areas of the southern Cape Province. At Port Alfred, for example, sea water seepage pools, at the mouth of the Kowie River, were almost entirely monopolized by *Aedes albocephalus*, whereas *caballus* was collected from rain water pools further inland. Like other pool breeding *Aedes* the eggs withstand desiccation, and there is evidence that they do not all hatch at once when the pool is refilled, but may wait for a subsequent drying out and refilling (Hopkins, 1952, p. 125).

Distribution. A paper by Dr. J. J. Steyn* (in the press) containing full details of the distribution of the species is to be published shortly. I shall therefore limit this section to general observations.

In South Africa records show that the species is widespread in the western part of the country, which corresponds to the southern half of the South-west Veld District (Edwards, 1941, p. 452). It is not however, common in every locality and is in fact found only at certain points along the coastal belt. There are no records of it as yet from the northern Transvaal or from the western Orange Free State, although there are now several from the southern Transvaal and the eastern Free State. Lack of intensive collecting in certain parts of the High Veld may, to some extent, account for these gaps. There are no records from the eastern Karroo although the species appears to be fairly common near the Cape. In South West Africa there are only two records, one is in the south and the other in the north, and there are none at all from Bechuanaland Protectorate.

***Aedes (Ochlerotatus) harrisoni* Muspratt (1953). (R; p).**

Taxonomy. Adults. — Since this species was described (1953a) I have received a male and a female specimen, collected near Cape Town by Mr. A. D. Harrison, which have dark wings, typical of this species, but with speckled palpi. They can therefore be either, this species with a-typical palpi, or *breedensis* with a-typical dark wings. In view of the locality I regard them as belonging to this species. It should be added that when adults are bred out with associated pelts, there would be no confusion as the larvae are quite distinct.

The relationship to the Australian *Aedes (O.) andersoni* Edw. has been noted (Muspratt *loc. cit.*) and I have recently been informed by Dr. Marks (*in litt.*) that there is a hitherto undescribed species which may be even closer to *harrisoni*. Mattingly (1954, p. 60) referring to the South African species says: "These show so close a resemblance to Australian species that it is difficult to decide whether they represent the results of variation after introduction or are genuine relics of an ancient 'antarctic' fauna".

* Steyn, J. J. & Schulz, K. H. (1955). *S. Afr. med. J.* 29 (48), pp. 1114-1120.

Distribution. CAPE PROVINCE: *published*: Hex River Valley (nr. Worcester), nr. Cape Town and nr. Fishhoek (Muspratt, 1953a, p. 55).

***Aëdes (Ochlerotatus) breedensis* Muspratt (1953). (R; p).**

Taxonomy. Adults. — See *harrisoni* above.

Distribution. CAPE PROVINCE: *published*: Worcester, Great Brak River, Little Brak River (Mossel Bay district) and Knysna (Muspratt, 1953a, p. 57).

***Aëdes (Finlaya) fulgens* Edwards (1917). (CR; t).**

Taxonomy. Adults. — The ornamentation of specimens from southern Africa would appear to be typical; in addition to the features noted by Edwards (1917, p. 213 and 1941, p. 121), there is a line of silvery scales on both the front and middle femora, from the base to about half (beneath) which on the latter joins the silvery patch in the middle (in front).

Bionomics. I have hatched out *fulgens* larvae from eggs which were laid in bamboo pots more than 12 months before (see also *Aëdes furcifer*, p. 174). Females have occasionally been taken biting by me in bush country, which is the chief habitat of the species.

Distribution. BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *published*: Potgietersrust (De Meillon *et. al.*, 1945, p. 99); *un-published*: Messina district, Chipise district, Wylie Poort, Baltimore, Damant's Drift (nr. Thabazimbi), Warmbaths district, Bushbuckridge district and Malelane district (C.S.I.R., 1953—1954).

***Aëdes (Finlaya) nyasae* Edwards, 1930. (R; t).**

Taxonomy. A note on the adults and a description of the larva have been published in this series (Muspratt, 1953b, p. 86).

Bionomics. This is a tree hole breeding species of the Transvaal High Veld bush. Only once has a female been taken biting by me.

Distribution. TRANSVAAL: *published*: Tzaneen, Ismay, (Rustenburg district), Witkoppen (nr. Johannesburg) (Muspratt, 1953b, p. 86 and 87); *un-published*: Nylstroom and Warmbaths districts (C.S.I.R., 1953).

***Aëdes (Finlaya) barnardi* Edwards (1924). (CR; t).**

Taxonomy. A description of the male, larva and other notes have already been published (Muspratt, 1953b, p. 85).

Bionomics. This is a forest tree-hole breeding species with a wide distribution in the montane and coastal timber forests of the Union, from the Transvaal to the Cape (see below). Females have frequently been taken biting.

Distribution. TRANSVAAL: *un-published*: Magoeba's Kloof (C.S.I.R., 1953). CAPE PROVINCE: *published*: Port St. Johns (Transkei), Kologha Forest (Stutterheim district), Groot River (Nature's valley), Knysna Forest, Kirstenbosch (nr. Cape Town) (Muspratt, 1953b, p. 86), Oudebosch (Edwards, 1941, p. 124); *un-published*: Tzitzikama Forest (C.S.I.R., 1951).

Aedes (Stegomyia) spp. (see introduction).

aegypti Linnaeus, 1762. (C; u, t, a, rarely p).

simpsoni Theobald, 1905. (C; u, a, t).

strelitziae Muspratt, 1950. (CR; a).

subargenteus Edwards, 1925. (R; t).

demeilloni Edwards, 1936. (CR; a, rarely t).

heischii van Someren, 1951. (CR; t).

dendrophilus Edwards, 1921. (CR; t).

metallicus Edwards, 1912. (CR; t).

calceatus Edwards, 1924. (R; t).

soleatus Edwards, 1924. (R; t, u).

contiguus Edwards, 1936. (CR; t).

poweri Theobald, 1905. (R; t).

pseudonigeria Theobald, 1910. (R; ? t).

amaltheus De Meillon and Lavoipierre, 1944. (t).

unilineatus Theobald, 1906. (R; t).

luteocephalus Newstead, 1907. (t, u, p).

vittatus Bigot, 1861. (CR; p).

***Aedes (Aedimorphus) marshalli* Theobald, 1901. (CR; t).**

Taxonomy. *Adults.* — These exhibit little variation. *Larva* — Comparison between the larva of this species and that of *capensis* has already been made (Muspratt, 1953b, p. 89).

Bionomics. This species is chiefly a bush-veld tree-hole breeding species of the Transvaal, but it also occurs in indigenous Montane forests in Natal, together with the closely allied *capensis*. In contrast to the latter it has frequently been taken biting.

Distribution. BECHUANALAND: *published:* Kasane (De Meillon, 1947, p. 116); *un-published:* Francistown (De Meillon, 1952). These records are from larvae; they are not likely to be confused with any other except the next species, but confirmation is desirable. TRANSVAAL: *published:* Komati-poort (Edwards, 1941, p. 161), Potgietersrust (De Meillon *et. al.*, 1945, p. 96); *un-published:* many records have accumulated during the last few years from several localities including the Zoutpansberg in the north, the central part, Johannesburg and the eastern Transvaal. There are, however, no records from the south west. NATAL: *published:* Eshowe (De Meillon, 1943, p. 100); *un-published:* Olivier's Hoek Pass, Royal National Park and Cathkin Park (Drakensberg), Ingeli Forest and Impetyeni Forest (Harding district) (C.S.I.R., 1951—1954).

***Aedes (Aedimorphus) capensis* Edwards (1924). (CR; t).**

Taxonomy: Notes on the adults and larvae have been published (Muspratt, 1953b, p. 89).

Bionomics. This is a tree-hole breeding species chiefly of the indigenous timber forests. I have never taken a female biting, although larvae were

abundant in tree holes. There are, however, some records of them biting in East Africa (Haddow *et. al.*, 1951, p. 221) but only very rarely (Garnham *et. al.*, 1946, p. 484).

Distribution. TRANSVAAL: *published*: Magoeba's Kloof (Muspratt, 1953b, p. 90); *un-published*: Letaba (De Meillon, 1934). CAPE PROVINCE: *published*: Embotyi (nr. Lusikisiki), Kambi Forest (Umtata district), Port St. Johns, Manubie Forest (Transkei) (Muspratt, 1953b, p. 90), Oudebosch (Edwards, 1941, p. 161); *un-published*: Kologha Forest (nr. Stuttersheim), Bedford district, Noetzi or Knoetzi (nr. Knysna) (C.S.I.R., 1951—1954). NATAL: *published**: Dukuduku Forest, Eshowe, Amanzimtoti, Renishaw (nr. Scottburgh), Ingeli Forest and Margate (Muspratt, 1953b, p. 89—90); *un-published**: St. Lucia, NKandhla Forest, St. Winifreds (South Coast), Impetyeni Forest (Harding district) (C.S.I.R., 1950—1952).

***Aëdes (Aëdimorphus) haworthi* Edwards, 1923. (R; t).**

Taxonomy: Possible confusion with the larva of *capensis* has been noted (Muspratt, 1953b, p. 89).

Distribution. TRANSVAAL: *published*: Rolle siding (Edwards, 1941, p. 165); *un-published*: Malelane district (C.S.I.R., 1954).

***Aëdes (Aëdimorphus) argenteopunctatus* Theobald, 1901. (R; p).**

Identification. Adults. — Although there are no males available for confirmation from terminalia, the species is easily distinguished from the two closely allied ones by the presence of pre-apical white spots on the anterior side of the middle and hind femora.

Distribution. BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *un-published*: Tzaneen (De Meillon, 1932), Sabie River (Bungalow Hotel) (C.S.I.R., 1954).

NOTE: the record of Ingram and De Meillon (1927, p. 43) from Eshowe (Natal) requires confirmation.

***Aëdes (Aëdimorphus) mixtus* Edwards, 1936. (R; p).**

Taxonomy. Adults. — The male terminalia of a series from northern Natal, bred out with associated pelts, are quite typical. *Larva.* — This has not yet been described. It is very similar to that of *A. argenteopunctatus* including the shape of the siphon, comb and pecten spines (Hopkins, 1952, p. 170). There are also two pairs of papillae on the under-side of the head, which are supplied with tracheoles like those illustrated by Lewis (1949, p. 62) for *A. argenteopunctatus*. It is believed that these serve a respiratory purpose when the larva is submerged (see also Hopkins, 1952 pp. 22—23). The only difference noted in chaetotaxy from *argenteopunctatus* is that head setae B and C and the sub-ventral tuft of the siphon each have one less branch, but this may be variable.

* These records refer to *A. haworthi*.

Head: antennal tuft about 3 plumose, or nearly simple, stoutish branches, below half. Setae A, B and C with 5—6, 3 and 3 stout plumose branches respectively, d minute, 3—5-branched. Other features as *argenteopunctatus* except that the sub-ventral tuft is 3-branched and the lateral seta single or 2-branched. Described from five associated larval pelts and two whole larvae.

Bionomics. Larvae were collected from a swamp pool. Females, probably of this species or *microstictus*, have been taken biting.

Distribution. TRANSVAAL: *un-published*: Rubbervale (nr. Leydsdorp) (De Meillon, 1927—35). NATAL: *un-published*: Dundee district (C.S.I.R., 1954).

NOTE: The above are the only records from male terminalia. The following probably refer to this species or *microstictus*, the published records being under *punctothoracis*. TRANSVAAL: *published*: Nylstroom, Warmbaths, Brits and Tamango (nr. Nelspruit) (Ingram and De Meillon, 1927, p. 18, and 1929, pp. 99—148); *un-published*: Magoeba's Kloof (C.S.I.R., 1953). CAPE PROVINCE: *published*: Knysna district (De Meillon, 1935, p. 354). ORANGE FREE STATE: *published*: Vaal Barrage (Bedford, 1928, p. 943). NATAL: Ntambanana and Mhlatuse settlements (Zululand) (Bedford, 1928, p. 943).

***Aedes (Aedimorphus) microstictus* Edwards, 1936. (R; p).**

Identification. It is doubtful if this species can be reliably separated from *mixtus* (see above) except by the male terminalia.

Distribution. TRANSVAAL: *published*: Pretoria (Edwards, 1941, p. 170).

***Aedes (Aedimorphus) bedfordi* Edwards, 1936.**

No specimens of the group, resembling the description of this species, have been collected in recent years.

Distribution. NATAL: *published*: Ntambanana (Zululand) (Edwards, 1941, p. 17).

***Aedes (Aedimorphus) filicis* Ingram and De Meillon, 1927. (CR; p).**

Taxonomy. Adults. — The pale markings on the scutum vary from white to yellowish, on specimens from different localities in South Africa, also the pale spots in the middle are not always very distinct.

Bionomics. Females have frequently been taken biting by me in forests in Natal and the Cape Province, and larvae have been collected from rain water pools in the forests.

Distribution. TRANSVAAL: *un-published*: Pietersburg (De Meillon 1926—35), White River district (C.S.I.R., 1954). CAPE PROVINCE: *published*: Blauwkrantz and Kaaiman's Gat (Edwards, 1941, p. 174); *un-published*: Embotyi (nr. Lusikisiki), Port St. Johns, Tzitzikama Forest, Groot Rivier Mouth (Nature's Valley) and Knysna Forest (C.S.I.R., 1951—1952). NATAL: *published*: Ntambanana (Edwards, 1941, p. 174), Eshowe (Ingram and De Meillon, 1927, p. 59); *un-published*: St. Lucia (Zululand), St. Winifreds

(South Coast), Ingeli Forest (Harding district) and Margate (C.S.I.R., 1950—1952).

Aëdes (Aëdimorphus) minutus Theobald, 1901. (R; p).

Taxonomy. — Specimens collected very recently will be discussed in a later paper.

Distribution. S.W. AFRICA: *published*: Tsumeb (De Meillon and Lavoipierre, 1944, p. 57). TRANSVAAL: *published*: Skukuza (Ingram and De Meillon, 1929, p. 136).

NOTE: The Zululand record of Edwards (1941, p. 177) would appear to be an error, as he identified the Skukuza specimens but did not record that locality.

Aëdes (Aëdimorphus) albocephalus Theobald, 1903. (CR; p).

Taxonomy. Adults. — The scales on the scutellum of both sexes are rather variable in shape and colour. They are seldom like the distinct broad silvery white scales of *filicis*. Even on the lateral lobes, of several specimens examined, they are only semi-broad and pale yellowish in colour; they could easily be mistaken for narrow scales. It is, therefore, doubtful if section 1 of the key of Edwards (1941, p. 158) is very satisfactory for separating this species. On a few specimens there are no scales on the post-spiracular area (noted also by Haddow *et. al.* 1951, p. 223).

Bionomics. The ability of this species to breed in almost pure sea water seepage pools has been observed (Muspratt, 1953a, p. 57) and also in crab holes containing brackish water (Hopkins, 1952, p. 182). At two places on the coast of South Africa I have found that these sea-water seepage pools were flooded only during the spring tides when enormous numbers of *albocephalus* larvae hatched out from eggs, which presumably had become dried when the pool basins were empty during the neap tides. The adults just had time to emerge before the pool basins again became empty.

Distribution. Present evidence suggest that the species occurs mostly on or near the coast in South Africa. CAPE PROVINCE: *published*: Knysna (Muspratt, 1953a, p. 57), Mossel Bay (Edwards, 1941, p. 178); *un-published*: Port Alfred, Groot Rivier Mouth (Nature's Valley) and Little Brak River (Mossel Bay district) (C.S.I.R., 1951—1954). NATAL: *published*: Ntambanana and Durban (Edwards, 1941, p. 178), Isipingo (Ingram and De Meillon, 1927, p. 45); *un-published*: St. Lucia and Mtunzini (C.S.I.R., 1952).

****Aëdes (Aëdimorphus) eritreae*** Lewis (1942). (R; p).

Taxonomy. Adult. — Two males resemble this species in having narrow decumbent scales on the vertex and a small pale knee spot on the hind femur. The terminalia also are nearer to this species than to *abnormalis* (Lewis, 1942).

Distribution. TRANSVAAL: *un-published*: Pienaar's River Siding (C.S.I.R., 1953).

Aedes (Aedimorphus) alboventralis Theobald, 1910. (R; p).

Identification. The terminalia of males from two localities in the Transvaal have been examined, but other records (Ingram and De Meillon, 1929, pp. 140 and 141) require confirmation.

Distribution. TRANSVAAL: *published*: Rolle Siding (Ingram and De Meillon, 1929, p. 137); *un-published*: Nylstroom (C.S.I.R., 1954).

Aedes (Aedimorphus) lesoni Edwards, 1932. (R; p).

Identification. Larva. — Dr. Steyn has kindly shown me some larvae which appear to belong to this species, or ssp. *verna* Lewis. These records perhaps require confirmation from male terminalia.

Distribution. BECHUANALAND: *published*: Gaberones (Edwards, 1941, p. 183). TRANSVAAL: *un-published*: Louis Trichardt, Letaba district, Warmbaths and Pilgrims Rest (Plague Research Lab., 1953 and 1954).

Aedes (Aedimorphus) lamborni Edwards, 1923. (R; p).

Distribution. TRANSVAAL: *un-published*: White River district (C.S.I.R., 1954). NATAL: *published*: Eshowe (Zululand) (De Meillon, 1943, p. 100); *un-published*: Oribi Gorge and Margate (C.S.I.R., 1951).

Aedes (Aedimorphus) quasiunivittatus Theobald, 1901. (CR; p).

Identification. Adults. — Females of this species can be separated from the other members of the group by the simple hind claws, but I prefer to rely only on male terminalia.

Bionomics. Females have been taken biting by me. Garnham (1946) found they bite at ground level in Kenya.

Distribution. TRANSVAAL: *published*: Duivelskloof, Leydsdorp, Skukuza and Nylstroom (Ingram and De Meillon, 1929, pp. 136—145), these perhaps require confirmation; Pretoria district, Onderstepoort (Edwards, 1941, p. 190); *un-published*: Ismay (Rustenburg district) (C.S.I.R., 1953). NATAL: *published*: Estcourt (Edwards, 1941, p. 190), Durban (Ingram and De Meillon, 1927, p. 39); *un-published*: Isipingo (De Meillon, 1945).

Aedes (Aedimorphus) dentatus Theobald, 1905. (C; p).

Identification. Adults. — Except by male terminalia it is hardly possible to separate females of this species from the next two.

Bionomics. Females were taken biting near the ground in the daytime in Uganda (Haddow *et al.* 1951, p. 224).

Distribution. TRANSVAAL: *published*: Pretoria (Edwards, 1941, p. 190), Onderstepoort (Bedford, 1928, p. 947); records of Ingram and De Meillon (1929) require confirmation; *un-published*: Magoeba's kloof (C.S.I.R., 1953). CAPE PROVINCE: *un-published*: Worcester district (C.S.I.R., 1951). ORANGE FREE STATE: *published*: Harrismith (Edwards, 1941, p. 190). NATAL: *published*: Durban (Bedford, 1928, p. 947) requires confirmation.

***Aëdes (Aëdimorphus) pachyurus* Edwards, 1936. (CR; p).**

Identification. Adults. — The male terminalia are quite distinct as illustrated by Edwards (1941, p. 192) and further taxonomic details have recently been published (Muspratt, 1953b, p. 87). *Larva.* — described in the latter paper.

Bionomics. It is believed that this species is a persistent biter, but it is not quite certain if the large number of females taken were these or *dentatus* (Muspratt, *loc. cit.*).

Distribution: (from males only). — CAPE PROVINCE: *published:* Kaaibansgat (Edwards, 1941, p. 191), Groot Rivier Mouth (Nature's Valley) (Muspratt, 1953b, p. 88); *un-published:* Bedford district (C.S.I.R., 1954).

***Aëdes (Aëdimorphus) subdentatus* Edwards, 1936. (R; p).**

Identification and Taxonomy. Adults. — See *bevisi* (below).

Distribution. CAPE PROVINCE: *published:* Grahamstown (Edwards, 1941, p. 193).

***Aëdes (Aëdimorphus) cummingsi* Theobald, 1903. (R; p).**

Identification. Larva. — Specimens collected by Dr. Steyn, which he has kindly shown me, appear to be quite typical, they are distinguishable from *durbanensis* by the chitinous plaques on the thorax and abdomen, the 2-branched sub-ventral tuft of the siphon and the lanceolate anal papillae (gills).

Distribution. NATAL: Reunion and Isipingo (Steyn, in the press).

***Aëdes (Aëdimorphus) bevisi* Edwards, 1915. (CR; p).**

Identification and Taxonomy. Adults. — Variation in ornamentation and similarity to *subdentatus* has been noted in previous papers (Muspratt, 1950, p. 77 and 1953b, p. 88). Furthermore it has now been found that at least one female with fairly distinct pale basal bands on the first two tarsal segments of all legs has an entirely dark proboscis like *subdentatus*. I have also come to the conclusion that the distinction thought to exist in the ninth tergite of the male terminalia (Muspratt, 1950) is due to the position from which the tergite is viewed. It, therefore, seems possible that *subdentatus* is only a variant of *bevisi*, and I am regarding all my records as belonging to the latter, which was the first named species.

Bionomics. It has been noted that females have been taken biting in several localities (Muspratt 1953b, p. 88) usually in coastal or montane forest.

Distribution. CAPE PROVINCE: *published:* "Caffraria" (i.e. an un-named locality in eastern districts) (Edwards, 1941, p. 195), Port Alfred and Worcester district (Muspratt, *loc. cit.*); *un-published:* Bedford district (C.S.I.R., 1954). NATAL: *published:* Ntambanana and Umhlatusi (Zululand) (Edwards, 1941, p. 195), Mtunzini district (North Coast) (Muspratt 1953b, p. 88), Durban (Edwards *loc. cit.*), St. Winifreds and Margate (South Coast) (Muspratt, *loc. cit.*).

**Aedes* (*Aëdimorphus*) *vexans* Meigen, 1830. (R: p).

The discovery of this species in South Africa has forged an interesting link in the chain of its world distribution, as it occurs practically throughout the Palaearctic, Oriental and Nearctic regions (Edwards, 1921, p. 265) but has not hitherto been found in the Ethiopian region.

Taxonomy. Through the kindness of Mr. P. F. Mattingly of the British Museum (Natural History) I have been able to compare the adults and larvae with *vexans* specimens from other parts of the world which he has loaned to me. The only difference I have observed between the Transvaal specimens and those from Oroville (Washington) U.S.A. and Morden (Surrey), England, is that the tibiae of the former are practically all dark except for the narrow basal pale bands and apical spots, whereas the tibiae of the latter are extensively pale posteriorly as also the first front and middle tarsal segments (and sometimes the hind also). Another small detail is that on the South African form the basal pale bands of the abdominal tergites are not narrowed in the middle, thus being as described for *arabiensis* (Edwards, 1941, p. 195). The palpi of the Transvaal male are only slightly longer than the proboscis (like *arabiensis*) whereas on a *vexans* specimen from Cranbrook (Canada) they are longer by more than the terminal segment. The male terminalia (fig. 1a) are almost as the typical form, the only difference noted being that the projection of the style to which the spine is attached is smaller and more resembles the style of *bevisi* or *subdentatus*. It is possible that this is a subspecies of *vexans*, but in view of the limited material at present available, I consider it unwise to name it as such at the moment. Descriptions of the specimens, however, are given below. The terminalia are also very near to *arabiensis*, but the basal lobe of the coxite would appear to be like that of *vexans*.

Male: This is in better condition than the female and details of ornamentation more easily seen. *Head:* vertex with narrowish white decumbent scales, erect scales black behind but pale in front. There is a pair of dark brown patches on the vestiture, each patch being towards the sides and just behind the eyes and with broad white scales on sides. Proboscis: dark. Palpi: as noted above and with four pale bands, one near the base, one in the middle of the shaft and at the bases of the penultimate and terminal segments. Those on the shaft are rather broader than the other two. There is a tuft of long hairs on the apex of the shaft, beneath, and the two distal segments are hairy. *Thorax:* scutum with a rather irregular pattern of pale and dark brown scales, on posterior half mostly dark. The pale scales are light brown with a narrow broken median dark stripe and a pair of broader sub-lateral dark stripes, which are confluent with a pair of large antero-lateral dark brown patches. Scutellum, paratergite, *apn*, *ppn* and post spiracular area with narrowish pale scales. Subspiracular area with a long patch of broad white scales and a small patch in front of it; also two patches of these scales on the sternopleura and mesepimeron. *Wings:* dark. *Legs:* *Femora:* sparsely speckled in front and with narrow white bands at base and narrowly white at tip, palish on basal

half or more, behind, and speckled on apical half. *Tibiae*: dark, with narrow basal white bands and very small apical white spots on the middle and hind tibiae, but with larger ones on the front tibiae (in front). *Tarsi*: dark, front and middle with rather short basal white bands on first three segments; hind with irregular short basal bands on all segments. Hind claws toothed.

Abdomen: Tergites dark scaled with broadish basal white bands, the lateral edges of the latter project apically to about half, but the bands are not narrowed in the centre. Sternites: pale with a pair of large dark apical lateral patches on 3—7, and dark median basal patches on all except first three segments, the patch on 7 joining the lateral dark patches. *Terminalia* (fig. 1a): see above.

Female. Resembles the male in most respects, including having the hind claws toothed. *Head: Palpi*: about one sixth length of proboscis, white tipped, with a white band near base and one or two white scales in the middle, beneath. *Legs: Femora*: with more pale speckling than the male, except near apex, one hind femur is predominantly pale scaled to near tip. *Tibiae*: with a few palish scales behind, in addition to other marking, but mostly dark scaled. *Tarsi*: fifth segment with the basal pale ring very faint on one leg, and absent on the other leg. *Abdomen*: basal white bands of tergites not reaching lateral edges; there are also quite large lateral patches not quite joining the basal bands. The sternites are almost entirely white scaled, except for rather small basal median dark patches, and a apical lateral pair of similar patches on segments 4, 5 and 6.

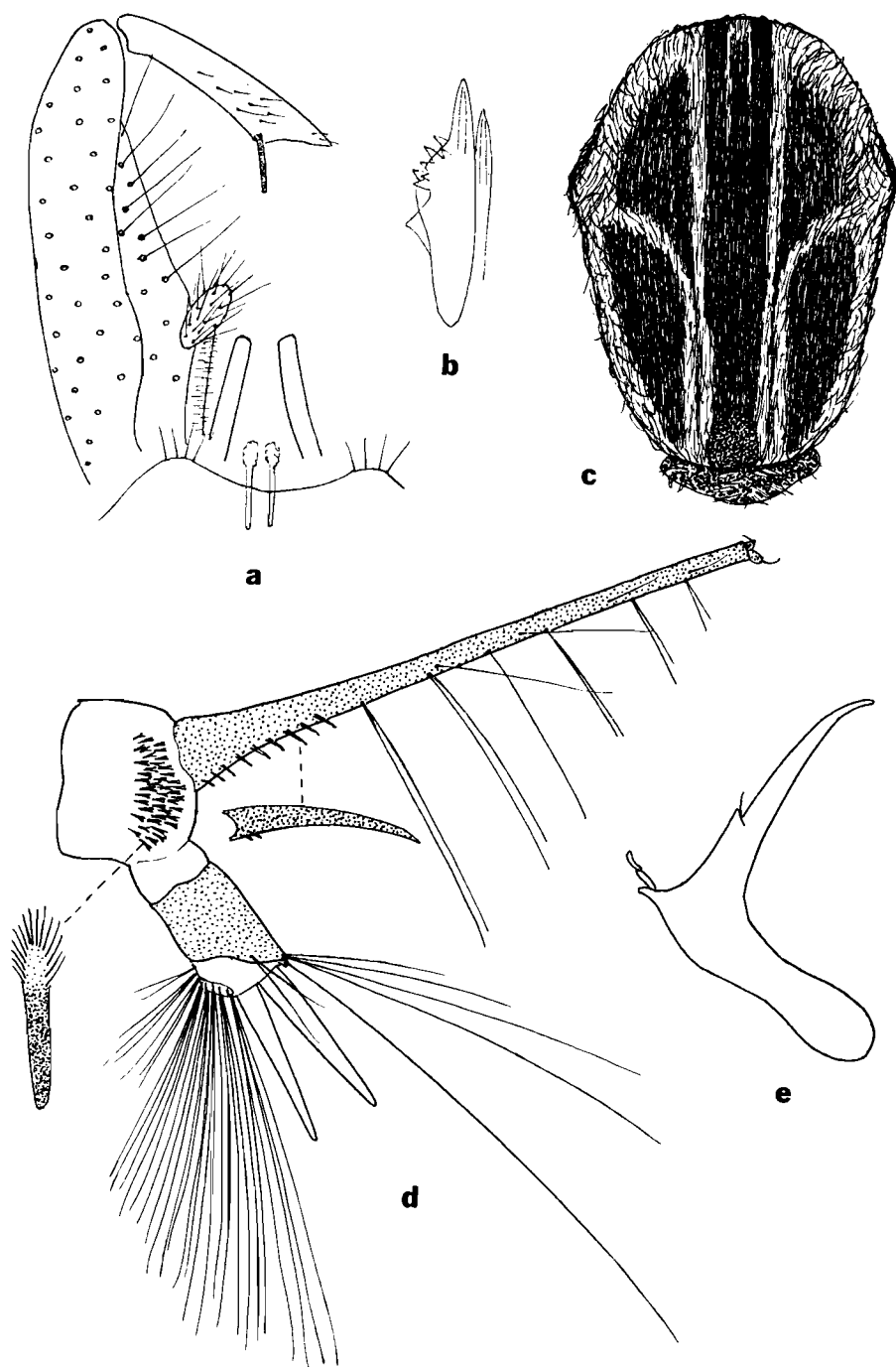
Larva: The only differences I can find between *vexans* larvae from the United States and China, which I have seen, and the Transvaal pelt is that on the latter both head setae B and C are single, whereas, on those *vexans*, C is usually 2—3-branched, but there is variation in larvae from other parts of the world (Barraud, 1934, p. 255) the upper caudal setae are 3-branched on the pelt, but 5—6 branched on the *vexans* larvae I have seen. The larva is very similar to those of *bevisi* and *dentatus*, the latter usually has head setae C 2—3-branched and the upper caudal 5—7-branched. Small differences from both these are found in the teeth of the mentum, which are rather larger and fewer in number, about 10 on each side, and the denticles of the pecten spines are of more equal size. *Head*: Setae A, B, and C simple, or sparsely plumose basally, with A, 5-branched and the other two single (B is rather thickened near the middle), d: 3-branched, e and f single. Mentum triangular with about 10 teeth on each side of the centre. A note on the mouth brushes is given below. *Abdomen*:

Fig. 1. *Aedes (A.) vexans* Mg. a: male terminalia.

Culex (C.) striatipes ssp. *joanae* ssp. nov. b: lateral plate of phallosome of male terminalia (viewed from above).

Culex (N.) pèringueyi Edw. c: ornamentation of adult scutum. d: terminal segments of larva.

Culex (M.) simpliciforceps Edw. e: style of male terminalia of a South African specimen.



comb, an irregular row, or patch, of about 10 dark spines, finely fringed at base; they are darker than those of *dentatus*. Siphon: index nearly 3 (un-mounted pelt), the sub-ventral tuft at about $\frac{2}{3}$, quite short and with 4 simple branches. Pecten: 17—18 spines, the distal two longer, simple and wider spaced, on other spines 2—3 denticles of nearly equal size. Saddle almost complete, with minute spicules, lateral setae short and single. Upper caudal setae 3-branched, lower single. Ventral brush: 6 pairs of tufts on the barred area and two median tufts, 2—5-branched. Anal papillae: more than twice length of saddle and lanceolate.

Note on larval mouth brushes. This species, like *A. (O.) caballus* Theobald (Hopkins 1952, p. 124) has modified comb like mouth brushes on the medio-ventral aspect, similar to those found in species of *Eretmapodites* (Hopkins, 1952, p. 225). *A. caballus*, however, is not known to be predatory like some *Eretmapodites* and other completely predatory larvae. The writer has found that these modified mouth brushes are present on larvae of *A. dentatus*, and also on some species of *Aedes (Stegomyia)* including *A. aegypti*. They may, therefore, be more common than was previously supposed on non-predatory larvae, and may have escaped notice owing to often being folded beneath the head on mounted specimens.

The specimens described above consist of a male with an associated larval pelt, which was reared from a batch of larvae hatched from eggs laid by the female; the latter was taken biting.

Distribution. TRANSVAAL: *un-published*: Warmbaths district (C.S.I.R. 1953).

***Aedes (Aedimorphus) hirsutus* Theobald, 1901. (C; p).**

Taxonomy. Adults. — On one or two specimens examined the pale line on the distal part of the costal fringe is not very pronounced.

Distribution. S.W. AFRICA: *published*: There are several records over a wide area in the northern part of the territory (De Meillon and Hardy, 1953, p. 31). BECHUANALAND: *un-published*: Francistown (Health Inspector, 1945). TRANSVAAL: *published*: the records are chiefly from the northern and north-eastern districts and the central and southern part including Pretoria (the latter from Edwards, 1941, p. 198), the former from Ingram and De Meillon (1929, pp. 136—145); *un-published*: Potgietersrust and Naboomspruit districts (C.S.I.R., 1953—1954). ORANGE FREE STATE: *published*: Vaal River Barrage (Edwards, 1941, p. 198), Bloemfontein (Bedford, 1928, p. 949). BASUTOLAND: *un-published*: Mamathes (Jacot Guillarmod, 1947). CAPE PROVINCE: Mtombe (Mkanduli district, Transkei) (De Meillon and Lavoipierre, 1944, p. 57). NATAL: *published*: Weenen (Edwards, 1941, p. 198); *un-published*: Harding (C.S.I.R., 1951).

***Aedes (Aedimorphus) fowleri* d'Emmerez de Charmoy, 1908. (R; p).**

Taxonomy. Larva. — Two larvae from Okimbahe (S.W.A.) without bred out adults, which are thought to belong to this species have the head covered with small tubercles instead of spicules. Other differences are that the

antennal tufts are 7—11-branched and head setae *d* from 2—7 branches (latter not included by Hopkins, 1952, p. 203). Otherwise the larvae are as typical *fowleri*.

Distribution. S. W. AFRICA: *published*: Ovamboland (Edwards, 1941, p. 199); *un-published*: Okimbahe (De Meillon, 1950). BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *published*: Pretoria (Edwards, 1941, p. 199), Komatipoort (Ingram and De Meillon 1929, p. 136, as *nigeriensis*), latter confirmed from male terminalia.

***Aedes* (*Aëdimorphus*) *durbanensis* Theobald, 1903. (R; p).**

Disease Transmission. Experiments carried out in Kenya on transmission of Rift Valley Fever were negative for this species (Kenya Colony Vet. Dept. Ann. Rep. for 1937, p. 61).

Distribution. TRANSVAAL: *published*: Pretoria (Edwards, 1941, p. 199). The latter locality is not recorded by Bedford (1928) and requires confirmation. NATAL: *published*: Durban (Edwards, 1941, p. 199); *un-published*: Mtunzini (C.S.I.R., 1952).

***Aedes* (*Aëdimorphus*) *ochraceus* Theobald, 1901. (R; p).**

Distribution. S. W. AFRICA: *published*: Ovamboland (Edwards, 1941, p. 201); *un-published*: Okakarara (De Meillon, 1950). TRANSVAAL: I have seen adults from Nylstroom and Rustenburg; these records will be published by Dr. Steyn (in the press). NATAL: Mtunzini (Steyn, in the press).

***Aedes* (*Banksinella*) *lineatopennis* Ludlow, 1905. (CR; p).**

Disease transmission. Females were able to retain the virus of blue-tongue disease of sheep, but transmission by bite was doubtful (Nieschulz *et. al.* 1934a).

Distribution. S. W. AFRICA: *published*: Okakarara (De Meillon and Hardy, 1953, p. 32). BECHUANALAND: *un-published*: Kasane (De Meillon, 1946). TRANSVAAL: *published*: the records of Ingram and De Meillon (1929, pp. 136—156) and Bedford (1928, p. 952) may be correct but they require confirmation, Johannesburg (De Meillon, 1946). ORANGE FREE STATE: *published*: Vaal River Barrage (Bedford, 1928, p. 952) (latter specimens examined), Harrismith (Edwards, 1941, p. 203); *un-published*: Brandfort district (C.S.I.R., 1954). NATAL: Seacow Lake (nr. Durban) (Ingram and De Meillon, 1927, p. 39, specimen determined by Edwards), Empangeni and Felixton (Ingram and De Meillon 1927, pp. 41 and 42), latter perhaps require confirmation; *un-published*: Bergville and Mtunzini (C.S.I.R., 1952—1954).

***Aedes* (*Banksinella*) *circumluteolus* Theobald, 1908. (CR; p).**

Identification. In southern Africa this species usually appears to be fairly clearly distinguishable from *lineatopennis*.

Bionomics. In East Africa and Nigeria it was found to frequent the forest floor and females bit human bait in the day time on the low level platforms

only. It was, therefore, considered to be of small importance in the forest cycle of yellow fever (Garnham *et. al.* 1946, p. 484; Mattingly, 1949b, p. 398, Lumsden, 1951, p. 327).

Distribution. BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *published*: un-recorded locality (Edwards, 1941, p. 205). NATAL: *published*: Ntambanana (Zululand) and Durban (Edwards, 1941, p. 205); *un-published*: St. Lucia (Zululand) (C.S.I.R., 1952).

Aëdes (Banksinella) luteolateralis Theobald, 1901. (CR; p).

Taxonomy. *Larva.* — Described in a previous paper (Muspratt, 1953b, p. 90).

Distribution. CAPE PROVINCE: *un-published*: Coffee Bay (Transkei) (C.S.I.R., 1952). NATAL: *published*: St. Lucia (Zululand) (Muspratt, *loc. cit.*), Durban (Edwards, 1941, p. 205); *un-published*: Isipingo district (De Meillon, 1945), St. Winifreds and Sunwich Port (South Coast) (C.S.I.R., 1951).

*** *Aëdes (Banksinella) albothorax*** Theobald, 1907. (CR; p).

Identification and Taxonomy. *Adults.* — Female specimens from the Transvaal and the Orange Free State have whitish scales on the head and on the pale parts of the wing, and yellowish white scaling on the scutum. A specimen from the latter province has some pale scaling in the middle of the proboscis (beneath) like *albothorax*, but the venter is mostly pale-scaled except for the eighth segment which is dark with a narrow apical pale band. Tentatively I am regarding them as belonging to this species.

Distribution. TRANSVAAL: *un-published*: Kempton Park (nr. Johannesburg) (Steyn, 1953), Bapsfontein (Benoni district) (Paterson, 1954). ORANGE FREE STATE: *un-published*: Brandfort district (C.S.I.R., 1954).

Aëdes (Diceromyia) furcifer Edwards, 1913. (R; t).

Identification and taxonomy. *Adults.* — The difficulty in separating females of this and *taylori* has been noted by Lewis, (1943, p. 72). Accurate determinations can, therefore, only be made from male terminalia. *Larva.* — see *taylori* below.

Bionomics. References relating to the suspected role of this species and the following two in the epidemiology of yellow fever are given in separate paper (Muspratt, 1956, in the press). In South Africa the *Diceromyia* species are tree-hole breeders mostly of the Transvaal Low Veld and the coastal belt of Natal, but they do not appear to be common anywhere (see also De Meillon, 1954).* I have hatched out larvae of *furcifer* from eggs which had been laid in bamboo pots more than 14 months before. The pots were stored in the laboratory and not in a humid insectary (see also *Aëdes fulgens*, p. 162).

Distribution. TRANSVAAL: *published*: Tzaneen (Ingram and De Meillon 1929, p. 139); Rolle siding (Edwards, 1941, p. 216); *un-published*: Potgietersrust district (Malaria Officer, 1948), Malelane district (C.S.I.R., 1954).

* Bull. World Hlth. Org., 11, pp. 485-487.

Records of either this species or *taylori* are: — *published*: Letaba (Ingram and De Meillon, 1929, p. 138); *un-published*: Waterpoort (C.S.I.R., 1953). NATAL: *un-published*: Isipingo Beach (C.S.I.R., 1950, determined from males).

***Aedes (Diceromyia) taylori** Edwards, 1936. (R; t).

Identification. Adults. — see *furcifer* (above), De Meillon (1943, p. 92) has noted certain aberration in the terminalia of males from Livingstone (N. Rhodesia). I have now compared more mounts from there and some from Zululand and have come to the conclusion that any differences from the type may be due to slight distortion in the mount. *Larva.* A rather cursory examination of larval material from southern Africa and comparison with descriptions (Hopkins, 1952, p. 213) makes it apparent that on larvae of both this species and *furcifer* head setae A and C have a very variable number of branches. C has from 3—8 or 10 branches in both species, which cannot reliably be separated in the larval stage. The sub-ventral tuft of *furcifer* is sometimes single. The longish spines on the upper distal edge of the saddle distinguish these larvae from some rather similar *Finlaya* larvae.

Distribution. S. W. AFRICA: *un-published*: Okimbahe (De Meillon, 1950), two larvae of this species or *furcifer* (adults not bred out). NATAL: *un-published*: Pongola River (Gollel district) (C.S.I.R., 1952, a female of *taylori* or *furcifer*), Dukuduku Forest (C.S.I.R., 1952, determined from males).

Aedes (Diceromyia) adersi Edwards, 1917. (R; t).

Taxonomy. Adults. — Some specimens of both sexes have scattered white scales on the abdominal tergites in addition to the basal white bands. The latter usually consist of a median patch of white scales touching the basal edge and a pair of narrow white bands running from, or nearly from this patch to the lateral edges, but removed from the basal edge. On some of the females the median white patches are absent on segments 6 or 7, and on one or two they are not present on any of the segments except for the median white band on segment 8. The sternites have broad basal white bands and median apical white patches on segments 2—4.

Distribution. TRANSVAAL: *published*: Tzaneen (De Meillon *et. al.* 1945, p. 93). NATAL: *un-published*: St. Lucia (Zululand) (C.S.I.R., 1952), Isipingo Beach (C.S.I.R., 1950).

Aedes (Diceromyia) fasciipalpis Edwards, 1912. (R; t).

Taxonomy. Adult. — One male specimen has a broad whitish band in the middle of the proboscis instead of the usual pale speckling.

Distribution. BECHUANALAND: *published*: Kasane (De Meillon, 1947, p. 116); *un-published*: Nata and Francistown (De Meillon, 1952). TRANSVAAL: *published*: Rolle Siding (Edwards, 1941, p. 218); *un-published*: Mes-sina district (C.S.I.R., 1953), Kaapmuiden (Oliff, 1953), Malelane district (C.S.I.R., 1954).

***Aedes (Dunnus) natalensis* Edwards, 1930. (CR; t).**

Taxonomy. *Larva.* — Described in a previous paper (Muspratt, 1953b, p. 90).

Bionomics. Females have frequently been taken biting in the daytime.

Distribution. SWAZILAND: *un-published*: Havelock Mine district (C.S.I.R., 1953). CAPE PROVINCE: Lusikisiki district (Transkei) and Mazeppa Bay (Transkei) (C.S.I.R., 1951). NATAL: *published*: Dukuduku Forest and St. Lucia (Zululand) (Muspratt, 1953b, p. 90), Durban (Edwards, 1941, p. 221), Amanzimtoti (Muspratt, *loc. cit.*); *un-published*: Mtunzini, St. Winifreds, Oribi Gorge and Margate (C.S.I.R., 1950—1952).

***Eretmapodites subsimplicipes* Edwards, 1914. (CR; u).**

Identification. *Adults.* — A study of male terminalia shows that this species is the only one of the *chrysogaster* group occurring in South Africa.

Bionomics. *E. chrysogaster* is a proved laboratory carrier of yellow fever and species of this group are vectors of Rift Valley fever in East Africa. References relating to these diseases are quoted in a separate paper (in the press). Females of *subsimplicipes* have frequently been taken biting by me in the day time. Although larvae have occasionally been collected from water in fallen leaves, in Natal, the chief breeding places are discarded tins, jars, broken bottles and similar vessels.

Distribution. TRANSVAAL: *un-published*: Sabie River (Bungalow Hotel) (C.S.I.R., 1954). NATAL: *published*: Umhlatusi (Edwards, 1941, p. 229), Empangeni (Ingram and De Meillon 1927, p. 42, as *chrysogaster*); Eshowe (De Meillon, 1943, p. 100 as *chrysogaster*); *un-published*: St. Lucia (Zululand) (C.S.I.R., 1952), Durban (M.O.H., 1929), Isipingo Beach (Woodiwiss, 1946), Amanzimtoti, St. Winifreds, Widenham (nr. Umkomaas), Renishaw (nr. Scottburgh), Port Shepstone and Margate (C.S.I.R., 1950 and 1951).

***Eretmapodites silvestris* Ingram and De Meillon (1927). (CR; a, u).**

Breeding-places. In addition to axils of *Dracaena* larvae have been collected from tins, jars and a bamboo pot.

Distribution. NATAL: *published*: Eshowe (Zululand) Edwards, 1941, p. 231); *un-published*: Dukuduku Forest (Zululand), St. Lucia (Zululand), Mtunzini (Zululand) and Reunion (C.S.I.R., 1950—1952), Isipingo Beach (De Meillon, 1945), Amanzimtoti and Widenham (nr. Umkomaas) (C.S.I.R., 1950—1951).

***Eretmapodites quinquevittatus* Theobald, 1901. (CR; u).**

Taxonomy. *Adults.* — One or two females have the yellow markings of the scutum narrower than usual, the scutum thus appearing darker, and the sub-lateral pair of yellow lines stop opposite the scutal angles,

Bionomics. Females have frequently been taken biting in the day time. Larvae have been collected from tins, jars, broken bottles and a bamboo pot.

Distribution. TRANSVAAL: *un-published*: Tzaneen (De Meillon, 1932), Ka-

wyns Pass (nr. Graskop) and Sabie River (Bungalow Hotel) (C.S.I.R., 1954). CAPE PROVINCE: *un-published*: Port St. Johns (Transkei), Coffee Bay (Transkei) and Mazeppa Bay (Transkei) (C.S.I.R., 1951—52), East London (van Rensen, 1952), Knysna district and Knysna Forest (C.S.I.R., 1951 and 1954. NATAL: *published*: Umhlatusi and Durban (Edwards, 1941, p. 237); *un-published*: St. Lucia (Zululand), Mtunzini (Zululand) and Stanger Beach (C.S.I.R., 1952), Isipingo Beach (De Meillon, 1945), Amanzimtoti, St. Winifreds, Widenham (nr. Umkomaas), Idomba River (nr. Sunwich Port), Ingeli Forest (Harding district) and Margate (C.S.I.R., 1950—1952).

Culex (Lutzia) tigripes Grandpré and Charmoy, 1900. (C; p, u).

Taxonomy. Adults. — In southern Africa specimens mostly conform to Edwards group 1 (1941, p. 248) the reference to white scaling at the base of the tarsi presumably meaning the paleness behind, or on the inner side of the first segment.

Breeding places. Larvae are generally found in pools including rock pools, which may be in the open or in bush or forest. I have only once found them in discarded tins, once in water which collected in a fallen log, and once in a cattle trough. The species is very abundant in forest pools of the southern Cape Province, particularly the Cape Peninsular, where it presumably brings about some reduction of the culicine fauna.

Distribution. S. W. AFRICA: *published*: Omaruru (De Meillon and Hardy, 1953, p. 32); *un-published*: Tsumeb (Murray, 1942), Okahandja (De Meillon, 1950). BECHUANALAND: *published*: Francistown (De Meillon, 1947, p. 116), Basinghall (Ingram and De Meillon 1927, p. 19); *un-published*: Nata (De Meillon, 1952). TRANSVAAL: the species is widespread but not always common in every locality; CAPE PROVINCE: *published*: Stellenbosch, Elsengberg, Cape Town and Fernwood (nr. Cape Town). (Bedford, 1928, p. 963), Kirstenbosch (De Meillon, 1935, p. 354), *un-published*: Durbanville, Millwood Forest (Knysna district) and Constantia district (C.S.I.R., 1951). NATAL: the statement for the Transvaal (above) applies to this province also.

Culex (Neoculex?) pulchrithorax Edwards, 1914. (R; ? p).

Distribution. TRANSVAAL: *published*: Onderstepoort (Edwards, 1941, p. 255). NATAL: *published*: Ulundi, van Reenen (Drakensburg) (Edwards *loc. cit.*).

Culex (Neoculex) avianus De Meillon, (1943). (R; p).

Identification. Adults. — These can be separated from *C. péringueyi* (see below) by the absence of white tips to the femora and only small apical lateral patches on the abdominal tergites, the latter sometimes on segments 6 and 7 only.

Distribution. TRANSVAAL: *un-published*: Rustenburg Kloof (C.S.I.R., 1953). NATAL: *published*: Cathedral Peak (Drakensburg) (De Meillon, 1943, p. 99).

un-published: Cathkin Park district (C.S.I.R., 1954). CAPE PROVINCE:
un-published: Kirstenbosch (Harrison, 1951), Coldstream (C.S.I.R., 1951).

Culex (Neoculex) péringueyi Edwards (1924). (R; p).

Identification and Taxonomy. *Adults.* — Specimens in good condition have a quite characteristic pale pattern on the scutum (fig. 1,c) rather similar to *C. avianus*. *C. péringueyi* differs from the latter in having the femora with white tips, and the abdominal tergites with apical white bands. The male also has shorter palpi than *avianus*. *Larva* (fig. 1,d). — This larva has not yet been described. It is not likely to be confused with any other on account of head setae B and C being 2-branched, the pecten spines having practically no denticles, and the very long simple and usually 2-branched proximal sub-ventral tufts of the siphon. *Head*: dark, antennae spiculate, tuft of 25—30 plumose branches at about two thirds. Setae A, B and C with 4—5 (plumose), 2 (simple) and 2 (simple) branches respectively, C being about the length of the head and B the same length or slightly shorter. Setae *d* single, *e* and *f* single or 2-branched, all simple. *Abdomen*: comb a patch of 35—40 small dark scales. Siphon: dark, with rows of minute spicules; five pairs of 2 branched (or single) and simple sub-ventral tufts on distal three quarters of siphon and two or three unpaired tufts beyond these, those nearest the base are 6 to 7 times the diameter of the siphon, but they become progressively shorter towards the apex. In addition there are 4 pairs of laterally placed setae, the proximal pair being 4 to 6 times the diameter of the siphon and the most distal quite small. Pecten: of 7—10 fairly small, slightly curved dark spines, without basal denticles, or one or two very small ones at base only. Saddle complete and with rows of minute spicules. Lateral setae 2-branched. Upper caudal setae: 4-branched; lower caudal: single (both simple). Ventral brush: 5 pairs of 5—7-branched tufts and 3 or 4 tufts outside the barred area, the latter being single or with 2—3 branches. Anal papillae (gills) about as long as the saddle, lanceolate and pointed at tips. Colour (in life) dark dull green, with dark head and siphon, length 6—7 mm.

The description is based on a pelt associated with a male and some larvae of the same batch, collected by the writer from pools in the bed of the Homtini River, Knysna district, Cape Province, in May 1951, and the associated pelts of two males collected by Mr. A. D. Harrison from rock pools at Kalk Bay Peak (Cape Peninsular) at about the same time.

Distribution. CAPE PROVINCE: *published*: Hout Bay and Pinelands (nr. Cape Town) (Edwards, 1941, p. 256); *un-published*: Piquetberg (or Piketberg), Du Toit's Kloof Pass (nr. Paarl), Maalgaten River (George district) and Knysna district (C.S.I.R., 1951). French Hoek Forest Reserve and Kalk Bay Peak (Cape Peninsular) (Harrison, 1951 and 1952).

Culex (Neoculex) salisburyensis Theobald, 1901. (C; p).

Identification. The larva is quite distinct and I regard records based on them as being reliable, although I have confirmed when possible from male terminalia.

Distribution. TRANSVAAL: *published*: Mokeetsi, Naboomspruit, Nylstroom, Middelburg, Tomango and Waterval Onder (Ingram and De Meillon, 1929, pp. 99—151), Brits and Pretoria (Edwards, 1941, p. 258); *un-published*: Johannesburg district (De Meillon, 1933). CAPE PROVINCE: *published*: Shoester's River, Cape Town, Hout Bay, Pinelands, Palmiet River and Oudebosch (Edwards, 1941, p. 258); *un-published*: There are several records from widely separated districts throughout the province, except the central Karroo, the following are the more important localities: — Upington, Van Rhynsdorp; Clanwilliam, Piquetberg or Piketberg), Port Alfred, Knysna and Worcester (C.S.I.R., 1951—1952), Graaff Reinet (Taylor, 1940), Mtombe (Transkei) (De Meillon, 1943). BASUTOLAND: *un-published*: Mamathes (Jacot Guillard, 1950). NATAL: *published*: Weenen, Estcourt and Eshowe (Edwards, 1941, p. 258), Gingindhlovu (Ingram and De Meillon, 1927, p. 43); *un-published*: Newcastle district and Cathkin Park (C.S.I.R., 1954), Royal National Park (Oloff, 1954).

***Culex (Neoculex) rubinotus**, Theobald, 1906. (R; p).

Identification. *Adults and larvae.* — Two males, with associated pelts, were bred out from the localities given below. The larval pelts are quite typical for this species (Hopkins, 1952). Edwards (1941) does not illustrate the terminalia, appendages on the lobe of the coxite are rather similar to the figure for *C. andreaeus* (p. 258), but the lateral plate of the phallosome is shorter than the latter species.

Distribution. CAPE PROVINCE: *un-published*: Port St. Johns (C.S.I.R., 1952). NATAL: *un-published*: Dundee district (C.S.I.R., 1954).

Culex (Neoculex) rima Theobald, 1901. (R; ? p).

Identification. *Adults.* — The terminalia of a male from St. Lucia (Zululand) are quite typical. The records of Bedford (1928) perhaps require confirmation, as they were queried by Edwards (1941, p. 263).

Distribution. NATAL: *published*: Mhlatuse Settlement (Bedford, 1928, p. 979), Eshowe (Ingram and De Meillon, 1927, p. 44), a mount of male terminalia I have examined from the latter collection may be *insignis*, but it is too old to be certain; *un-published*: St. Lucia (Zululand) (De Meillon, 1937).

***Culex (Neoculex) insignis** Carter, 1911. (R; p).

Identification. *Adults.* — See *rima* (above); the records below are from male terminalia.

Distribution. NATAL: *un-published*: Isipingo Beach (Woodiwiss, 1946), Amanzimtoti (C.S.I.R., 1951).

***Culex (Neoculex) horridus** Edwards, 1922. (R; t).

Taxonomy. *Adult.* — A single male specimen has pale lateral patches on tergites 5, 6 and 7 only. A specimen from Balovale (N. Rhodesia) is the same in this respect.

Breeding place. Bred out from a larva collected from a tree hole (*Ficus* sp.).

Distribution. NATAL: *un-published*: Pongola River (Gollal district) (C.S.I.R., 1952).

Culex (Neoculex) sp. indet.

Only one male of this probably new species has been collected, and it is felt to be advisable to defer publication of a description until more material is available. The terminalia suggest that it is allied to *C. salisburyensis*.

Distribution. CAPE PROVINCE: *un-published*: Clanwilliam (C.S.I.R., 1951).

Culex (Culiciomyia) nebulosus Theobald, 1901, and var. **pseudocinerus** Theobald, 1901. (C; t, u, a).

Identification and Taxonomy. *Adults.* — Both the type form and the variety are present in southern Africa, the differences in pleural scaling (Edwards 1941, p. 273) being fairly distinct. In many cases determinations have been made from larvae, or adults have not been preserved, but, where I have been able to examine the adults, the form occurring in a particular locality is noted below (in brackets) and refers to the one previous locality only.

Bionomics. According to Lewis (1947, p. 552) females do not bite man in the Sudan, but Garnham *et. al.* (1946, p. 485) collected some adults on high and low forest platforms in Kenya. The latter author and Haddow *et. al.* (1951, p. 231) record a variety of breeding places for the species. In South Africa, however, I have only found larvae in tree holes, tins, tanks and once in a bamboo pot, also in a *Strelitzia* axil, but never in rock holes or ground pools.

Distribution. S. W. AFRICA: *published*: Karabih, Okimbahe (var.), Franzfontein (De Meillon and Hardy, 1953, p. 32). BECHUANALAND: *published*: Nata and Kasane (De Meillon, 1947, p. 116); *un-published*: Shashi (Manley, 1946), Martin's Drift (type form) (C.S.I.R., 1953). TRANSVAAL: *published*: Letaba (Ingram and De Meillon, 1929, p. 139). *un-published*: Messina (var.), Wylie Poort (var.), and Magoeba's Kloof (type form) (C.S.I.R., 1953), New Agatha (type form) (De Meillon, 1953), Nylstroom (var.) (C.S.I.R., 1953), Johannesburg (var.) (De Meillon, 1948). CAPE PROVINCE: *un-published*: Coldstream (type form) and Groot Rivier Mouth (Nature's Valley) (C.S.I.R., 1951 and 1952). NATAL: *published*: Ntambanana (var.) (Edwards, 1941, p. 274), Eshowe (type form and var.) (Ingram and De Meillon, 1927, p. 44); *un-published*: Isipingo district (De Meillon, 1945), Amanzimtoti (type form) and Baven-on-Sea (C.S.I.R., 1950 and 1951).

***Culex (Culiciomyia) cinerellus** Edwards, 1922. (R; p, ?t, ?u).

Taxonomy. *Larva.* This only differs from the description of Hopkins (1952, pp. 273 and 275) in having head setae C with 4 branches.

Breeding place. The Transkei record is from a single male, with associated

pelts, bred out from larvae collected from a rot hole in the roots of a soft-wood tree (*Milletia Sutherlandi*).

Distribution. CAPE PROVINCE: *un-published*: Embotyi (Lusikisiki district) (C.S.I.R., 1951). NATAL: *un-published*: Felixton (De Meillon, 1926—1935).

Culex (Mochthogenes) inconspicuus Theobald, 1932. (CR; p).

Identification. Adults. It seems from an examination of old mounts of male terminalia that some of the records for this species probably refer to *simpliciforceps*.

Distribution. TRANSVAAL: *published*: Ingram and De Meillon (1927, p. 18—19 and 1929, pp. 99—146) give several records from the northern, central, southern and eastern districts. The type locality is unknown (Edwards, 1941, p. 279); *un-published*: Pretoria (van Heerden, 1941). CAPE PROVINCE: *un-published*: Embotyi (Lusikisiki district) (C.S.I.R., 1951). NATAL: *published*: Ingram and De Meillon (1927, pp. 40—44) list several localities on the coastal belt of Zululand; there are mounts of typical larvae from Gingindlovu district; *un-published*: Umlaas River (Pietermaritzburg district) (C.S.I.R., 1950, the latter from a female with an associated larval pelt) and Melville (South Coast) (C.S.I.R., 1951).

***Culex (Mochthogenes) simpliciforceps** Edwards (1941). (R; p).

Identification and taxonomy. Adults: The phallosome of the male terminalia of specimens from South Africa appears to be typical. The style (fig. 1,e), however, has a blunt tooth on the outer margin and arising from the base of this there is a short seta. This does not quite accord with Edwards' description (1941, p. 279) as the seta is not mentioned, although the tooth may be hardly visible unless the style is quite flat. This form of style is the same as specimens from the Belgian Congo from the pelts of which the description of the larva was taken (De Meillon, Parent and Black, 1945, p. 86). Specimens of both sexes have narrow decumbent scales on the vertex, except round the eye margins and most have the hind femur pale below from the base to near tip, which is correct for this species. *Larva:* This is distinguished from that of *inconspicuus* by the 3—4-branched head setae B and the shorter sub-ventral tufts of the siphon, the proximal pair being about twice the diameter of the siphon. On specimens from the Transkei, head setae C are shorter than B, but usually not as short as those of *inconspicuus*.

Bionomics. In the Transkei adults were collected while resting on the banks of a stream in high dense forest; some of the females had fed on blood, but the host is unknown.

Distribution: CAPE PROVINCE: *un-published*: Embotyi (Transkei) (C.S.I.R., 1951). NATAL: *un-published*: Eshowe (De Meillon, 1935).

Culex (Culex) poecilipes Theobald, 1903. (R; p).

Bionomics and disease transmission. Lumsden and Buxton (1951, p. 75) had reasons to suspect *poecilipes* as a possible vector of yellow fever in the West

Nile Province of Uganda as it was taken biting in the forest canopy and bred in stream pools during the dry season. Lewis (1947, p. 552) notes that it attacks man, particularly at night, in the Sudan. The species is not very common in South African (De Meillon, 1954).

Distribution. S. W. AFRICA: *published*: Runtu, Ondangua, Oshikango (De Meillon and Hardy, 1953, p. 32). BECHUANALAND: *published*: Muhembo and Maun (De Meillon, 1947, p. 116). TRANSVAAL: *published*: Ingram and De Meillon (1927, pp. 18—19), and 1929, pp. 136—148) list several places in the northern, central, southern, and eastern districts under *quasi-gelidus*; *un-published*: Letaba (De Meillon, 1926), Naboomspruit (C.S.I.R., 1954), Bapsfontein (Benoni district) (Paterson, 1955). NATAL: *published*: Hluhluwe River and Gingindhlovu (Ingram and De Meillon, 1927, pp. 39 and 43).

***Culex (Culex) ethiopicus* Edwards, 1912. (CR; p).**

Identification. *Adults.* — The species is easily distinguished from the next two by the broad apical pale bands on the abdominal tergites. Earlier records for *C. bitaeniorhynchus* refer to this species which was formerly regarded as a variety of it. There is no evidence, from male terminalia, that *bitaeniorhynchus* occurs in South Africa. *Larva.* It is doubtful if this larva can always be separated from *annulioris* with certainty.

Distribution: S. W. AFRICA: *published*: Ondangua and Franzfontein (De Meillon and Hardy, 1953, p. 32). BECHUANALAND: *un-published*: Gaborones (Drew, 1930). TRANSVAAL: *published*: Ingram and De Meillon (1927, p. 17 and 1929, pp. 101—105) list several widely distributed localities, and Bedford (1928, p. 968) records Onderstepoort; male terminalia have been checked from the following: Mokeetsi, Nylstroom and Waterval Boven. NATAL: *published*: Hluhluwe River (Ingram and De Meillon, 1927, p. 40); *un-published*: Tugela district (C.S.I.R., 1952).

****Culex (Culex) aurantapex* Edwards, 1914. (R; p).**

Distribution: The following have been checked from male terminalia: TRANSVAAL: *un-published*: Potgietersrust district (De Meillon, 1941). NATAL: *un-published*: St. Lucia (Zululand) (Muspratt, 1942).

NOTE: Ingram and De Meillon, (1927, p. 42) record this species from Empangeni (Zululand), but the only remaining specimen from their collection, labelled as this species, turns out to be *Ficalbia lacustris* (q.v.). The record is, therefore, doubtful.

***Culex (Culex) annulioris* Theobald, 1901. (C; p).**

Identification and taxonomy. *Adults.* — Normally these have pale triangular median patches and lateral apical patches on abdominal tergites 2—7, which makes them easily distinguishable from *ethiopicus* (see above). A male from Knysna district, however, lacks the median triangles.

Distribution. TRANSVAAL: Ingram and De Meillon (1927, p. 18 and 1929 pp. 99—151) list several localities, and Edwards (1941, p. 294) gives Pretoria;

un-published: There are records from Johannesburg and district. CAPE PROVINCE: *published*: Palmiet River (De Meillon, 1935, p. 354); *un-published*: There are several records from Clanwilliam in the west to Port St. Johns in the east, including Port Alfred and Millwood Forest (Knysna district) (C.S.I.R., 1951). ORANGE FREE STATE: *published*: Vaal River Barrage (Edwards, 1941, p. 294). NATAL: Ingram and De Meillon (1927, pp. 41—45) give some localities in Zululand, Bedford (1928, p. 969) records Mhlatuse settlement; and Edwards (1941, p. 294) records Durban; *un-published*: two inland localities worth noting are Dundee district and Dalton district (C.S.I.R., 1950—1954).

Culex (Culex) duttoni Theobald, 1901. (C; p, rarely u).

Distribution. S. W. AFRICA: *published*: Omaruru (De Meillon and Hardy, 1953, p. 32). BECHUANALAND: Francistown (De Meillon, 1952), Mochudi (1934). TRANSVAAL: *published*: Ingram and De Meillon, (1927, p. 18, 1929, pp. 99—102 and pp. 138—148) list several localities in the northern, eastern, and southern districts, Bedford (1928, p. 970) records it from Onderstepoort. CAPE PROVINCE: *un-published*: Port St. Johns (Transkei), Kologha Forest (nr. Stutterheim) and Coldstream (C.S.I.R., 1951—1952), Maalgat River (George district) (Harrison, 1950). NATAL: *published*: Mkusi River, Hluhluwe River, Gingindhlovu, Tugela and Jacobs (Ingram and De Meillon, 1927, pp. 40—45); *un-published*: Durban (De Meillon, 1937), NKandhla Forest, Amanzimtoti, Ingeli Forest (Harding district) and Margate (C.S.I.R., 1950—52).

Culex (Culex) argenteopunctatus ssp. *kingi* Theobald, 1913. (R; p).

Identification. *Adults*. — Two specimens from Zululand and a rather damaged one from Bechuanaland would appear to have the normal sub-specific characters (Edwards, 1941, p. 304).

Distribution. BECHUANALAND: *published*: Nata (De Meillon, 1947, p. 116). NATAL: *un-published*: Eshowe (Zululand) (De Meillon 1935). *Note*: I have been unable to find any record from S. W. Africa referred to by De Meillon and Hardy (1953, p. 31).

Culex (Culex) theileri Theobald, 1903. (A; p).

Disease transmission. This widely distributed species has been shown to be able to harbour the virus of Rift Valley fever, although transmission by bite was negative (Ann. Rep. S. A. Inst. Med. Res. for 1953, pp. 45 and 54).

Distribution. S. W. AFRICA: *published*: Okahandja (Edwards, 1941, p. 306); *un-published*: there are several widely separated localities recorded in the northern part of the territory and one (Warmbad) in the south. BECHUANALAND: *published*: Palapye and Lobatsi (De Meillon, 1947, p. 116); Basinghall (Ingram and De Meillon, 1927, p. 19); *un-published*: Seronga and Gomare (De Meillon, 1949). TRANSVAAL: *published*: Brits, Pretoria, and Johannesburg (Edwards, 1941, p. 306) and several other localities (Ingram and De Meillon, 1927, p. 19, 1929, p. 98, 136—151, and 155—156); *un-*

published: There are many records particularly from the southern High Veld. CAPE PROVINCE: *published*: Mafeking, Ceres, Mossel Bay, Stellenbosch and Cape Town (Edwards, 1941, p. 306); *un-published*: there are records from widely separated localities in the north, including Schmidt's Drift on the Vaal River and Upington on the Orange River (C.S.I.R., 1951). There are some records from the eastern Karroo and Port St. Johns (Transkei) (C.S.I.R., 1952—1954). The species occurs at points along the southern coast and is very abundant in the south-west as far north as Piquetberg (Piketberg) (C.S.I.R., 1951). ORANGE FREE STATE: *published*: Vaal River Barrage and Bloemfontein (Edwards, 1941, p. 306); *un-published*: there are some additional localities in the north and south, and recently several records have accrued from the south-west (Schulz, 1951). BASUTOLAND: *un-published*: Mamathes (Jacot Guillarmod, 1950). NATAL: *published*: Durban and Weenen (Edwards, 1941, p. 306); *un-published*: The species is widespread throughout the province except in the extreme west and south, where there are at present no records.

***Culex (Culex) univittatus* Theobald, 1901. (C: p).**

Biting habit. Lumsden and van Someren (1953, p. 22)* suspected var. *neavei* of this species to be possible vector of yellow fever in monkeys in Uganda. According to Lewis (1947, p. 552) the type form and the variety have different biting habits in the Sudan, the latter being far more anthropophilic than the former, but De Meillon (1947, p. 116) found *univittatus* to be a persistent biter of man and monkey in Bechuanaland.

Distribution: S. W. AFRICA: *published*: Okahandja (Edwards, 1941, p. 308); *un-published*: several localities are recorded in the northern part of the territory (De Meillon, 1950). BECHUANALAND: *published*: Kasane, Muhembo, Shakawe, Nokanen, Maun and Nata (De Meillon 1947, p. 116), Basinghall (Ingram and De Meillon, 1927, pp. 18 and 19); *un-published*: Chobe Rapids, Seronga and Gomare (De Meillon, 1949). TRANSVAAL: *published*: Pretoria (Edwards, 1941, p. 308), Ingram and De Meillon (1929, pp. 99—103 and 136—151) list several localities in different parts of the province; *un-published*: additional records are mostly from the central and southern High Veld. SWAZILAND: Mbabane (C.S.I.R., 1954). CAPE PROVINCE: *published*: Mafeking (Bedford, 1928, p. 972), Cape Town, Hout Bay and Palmiet River (De Meillon, 1935, p. 354), Grahamstown (Edwards, 1941, p. 308); *un-published*: Grootfontein and Middelburg (Steyn, 1944), Mkanduli (Transkei) (De Meillon, 1943), Bedford district (C.S.I.R., 1954). ORANGE FREE STATE: *published*: Vaal River Barrage (Edwards, 1941, p. 308) Bloemfontein (Bedford, 1928, p. 972); *un-published*: there are additional records from the south western part. BASUTOLAND: *un-published*: Mamathes (Jacot Guillarmod, 1949). NATAL: *published*: Candover, Mhltuse, Weenen (Bedford, 1928, p. 972), Durban (Edwards, 1941, p. 308); *un-published*: there are records from all over the province except the south western part.

* *Proc. R. ent. Soc. Lond.* (B) 22 (1-2), pp. 19-22.

Culex (Culex) simpsoni Theobald, 1905. (C; p).

Taxonomy. Adults. — Some from S. W. AFRICA have a faint pale line on the anterior side of the middle tibia and are thus very similar to *C. striatipes*. The inner division of the lateral plate of the phallosome of the male terminalia is, however, as long or longer than the outer division, which is as it should be for *simpsoni*.

Distribution: S. W. AFRICA: *published:* Grootfontein, Auchab Drift, Brandberg, Kaokoveld (De Meillon and Hardy, 1953, p. 32); *un-published:* Windhoek (Murray, 1942). BECHUANALAND: *published:* Kasane (De Meillon, 1947, p. 116). TRANSVAAL: *published:* Ingram and De Meillon (1927, pp. 18—19 and 1929, pp. 102—104, 136—151 and 155) list several widely spread localities and Bedford (1928, p. 975) records Onderstepoort; *un-published:* additional localities are Messina (C.S.I.R., 1953), Rustenburg (De Meillon, 1928), Johannesburg (Ordman 1935). CAPE PROVINCE: *published:* Grahamstown (Edwards, 1941, p. 310); *un-published:* Qualora (Transkei) (De Meillon, 1941). NATAL: *published:* Ingram and De Meillon (1927, pp. 39—44, and as *C. richteri* pp. 41, 45, and 72) record Durban and several localities in Zululand; Bedford (1928, p. 976) also records Weenen; *un-published:* Keate's Drift (Mooi River) (C.S.I.R., 1952).

***Culex (Culex) striatipes** Edwards (1941), ssp. *joanae* ssp. nov. (R; p).

Description. Adults. — These differ from the typical *C. striatipes* Edwards (1941, p. 311) in having no anterior white stripe on the middle femur and the middle tibia either all dark or with at most a faint anterior pale stripe. The hind femur is pale anteriorly only to about half instead of the usual 4/5. The latter character is probably the most reliable distinction as on some otherwise typical specimens from southern Rhodesia one or more of the white lines on the anterior side of the front and middle femora, and on the middle tibia, are faint or absent. The type series of ssp. *joanae* are rather larger and darker than *striatipes* from southern Rhodesia.

Female. Head: with both the decumbent narrow scales and the erect scales pale on the centre of the vertex, but darker at the sides, and with narrow pale scales round eye margins. Proboscis all dark. *Thorax:* integument dark and scutal scales mostly brown, with pale scaling round margins, a pair of sub-lateral pale patches in centre, and pale round bare space. Scutellum with narrow pale scales. Pleurae with the usual post spiracular and pre-alar white scale patches. *Legs:* as noted above, and the femora with small pale knee spots, front femur palish beneath and hind, pale behind to beyond half, but dark dorsally. Hind tibia with the usual large white spot at tip, other tibiae with small spots; tibiae also palish behind for all or part of the length. *Abdomen:* tergites with basal creamy white bands and lateral patches (usually joining them on segments 2—7; sternites almost all pale with median dark patches.

Male: Type and other males resemble the female in most respects, but pale

patches on scutum indistinct being pale only round pre-scutellar bare space. Palpi: with pale scales on distal two segments at base (beneath). *Abdomen*: lateral white patches small or absent, except on 7; sternites with large lateral basal creamy white patches joining medianally. *Terminalia*: as the typical form, but outer division of lateral plate of phallosome apparently rather broader, as viewed from above.

Larva: This appears to be practically as the typical form (De Meillon, Parent and Black 1945, p. 90 and Hopkins, 1952, p. 297). *Head*: antennal tuft with about 25 plumose branches; setae A: 5—9-branched, B: 2-branched, C: single or 2-branched. B and C are rather sparsely plumose. *Abdomen*: Comb, siphon, pecten etc. as the typical form, but the sub-ventral tufts of the siphon are sometimes 2-branched and there are two longish stout spines on the dorsal valves of the siphon similar to those of *argenteopunctus* ssp. *kingi* (Hopkins, 1952, p. 288), these have two short spines at the base. Lateral seta: usually 2—5-branched (rarely single). Anal papillae (gills): on un-mounted larvae approximately as figured in Hopkins (1952, p. 297). The latter appear to be tracheal gills, as they are supplied with tracheoles similar to those figured by Lewis (1949, p. 64) and there are also cephalic gills, on the under side of the head, like those of *Culex argenteopunctatus* ssp. *kingi* (Lewis, *loc. cit.*, p. 62, and Hopkins, 1952, p. 23).

Described from the male holotype with five male and six female paratypes, with one associated larval pelt and several larvae. Larvae were collected by me (in January, 1954) from a flooded grassy area adjoining a stream (Whiskey Spruit) near the Lydenburg to Sabie road over Mount Anderson, at nearly 7,000 feet above sea level. The sub-species is named after Mrs. Joan Wright who has assisted me very materially with my field collecting expeditions of the last four years.

***Culex (Culex) terzii* Edwards (1941) (R; p).**

Identification and taxonomy. The terminalia of males from Magoeba's Kloof, Tzaneen and Waterval Boven appear to be this species, from the shape of the style and outer division of the lateral plate of the phallosome. The sharp pointed projection on the latter, referred to by Edwards (1941, p. 313), doubtless means the projection which arises from the inner side and points outward; it is more pointed than that of *vansomereni* but similar to *toroensis*, from which males are distinguished by having pre-alar scales. One male and one female have pale scaling in the middle of the proboscis (beneath), but the marking on the venter of the latter is typical. The other female has broad reversed V-shaped marking on sternites 5—7 rather similar to the males.

Breeding places. Adults were bred out by me from pupae collected from a cement tank and a road side pool.

Distribution. TRANVAAL: *published*: Waterval Boven and Waterval Onder (Ingram and De Meillon, 1929, pp. 150 and 151, as *vansomereni*, but they were re-classified by Edwards, 1941, p. 313); *un-published*: Magoeba's Kloof (C.S.I.R., 1953).

Culex (Culex) pipiens Linnaeus, 1758. (C; p).

Identification and taxonomy. Adults. — It is outside the scope of this paper to discuss the genetical relationships of the *C. pipiens* complex. The reader is referred to the symposium of Mattingly *et. al.* (1951). From the present evidence available it would appear that *pipiens* and *fatigans* rarely if ever interbreed in southern Africa and behave as two quite distinct species, although Mr. Mattingly has informed me (*in litt.*) that the terminalia of two males from the Cape Province, which were amongst some I sent to him, may possibly be hybrids although nearer to *fatigans*.

Distribution. Most of the records given below have been confirmed from male terminalia. Determinations made from larvae may refer to *fatigans*, as De Meillon (1943, p. 96) has noted that some of the latter resembled *pipiens*. S. W. AFRICA: *un-published*: Usagos, Swakopmund and Walvis Bay district (Murray, 1942). TRANSVAAL: *published*: Elim Hospital, Tamango, Kro-kodilpoort and Komatipoort (Ingram and De Meillon, 1927, p. 18, and 1929 pp. 99, 101 and 104). It is not certain if the additional records for this and other provinces, given by Bedford (1928, p. 973) are based on male terminalia or not, but records from Johannesburg have been confirmed. CAPE PROVINCE: *published*: Cape Town and Fishhoek (De Meillon, 1935, p. 354); *un-published*: Grootfontein (Steyn, 1944), Port St. Johns (Transkei), Clanwilliam, Citrusdal, Muizenberg and Groot Rivier Mouth (Nature's Valley) (C.S.I.R., 1951), French Hoek (Harrison, 1952). NATAL: *published*: Hluhluwe River and Eshowe (Ingram and De Meillon, 1927, pp. 40 and 44), Durban (Edwards, 1941, p. 315) *un-published*: Empangeni, Nkwadini (De Meillon, 1935), Mtunzini district, Harding and Port Shepstone (C.S.I.R., 1951—1952), Pietermaritzburg (Oliff, 1953).

Culex (Culex) fatigans Wiedemann, 1828. (A; u, p).

Specific status. In view of the ability of this species to hybridize with *pipiens* in certain parts of the world, producing fertile offspring, most systematists now regard it as a sub-species of the former (Knight, 1953; Rozeboom and Gilford, 1954). As the matter is still under consideration and as there is no definite evidence of hybridization between *pipiens* and *fatigans* in the Ethiopian region I am retaining the specific status in this paper (see also *pipiens* above).

Disease transmission. *C. fatigans* is a proved, but weak, laboratory carrier of yellow fever, (Davies, 1933) not, however, suspected in nature.

Distribution: This common domestic species is found throughout southern Africa, except in the more arid parts, one record being from Robben Island off Cape Town (De Meillon, *un-published*, 1949). It occurs in Bechuanaland Protectorate, at Francistown and Palapye, (De Meillon, 1947, p. 116) from which territory there are at present no records for *pipiens*. There are few records from the Orange Free State and western Karroo (central and northern Cape Province), but it probably breeds in some of the larger townships.

***Culex (Culex) zombaensis** Theobald, 1901. (R; p).

Taxonomy. Adults. — Most of the specimens have rather large lateral basal white patches on the abdominal tergites which are not always joined by complete basal white bands.

Distribution: The following have been checked from male terminalia: NATAL: *un-published:* Dalton district (C.S.I.R., 1950), Isipingo Beach (Woodiwiss, 1946), Melville (South Coast) (C.S.I.R., 1952).

Culex (Culex) trifilatus Edwards, 1914. (CR; p, rarely t).

Taxonomy. Adults. — On most specimens examined about the distal third of the anterior surface of the hind femur is dark like ssp. *aenescens* (Edwards, 1941, p. 323), but the male terminalia are as the typical form. *Larva.* Pelts associated with two typical males from the Cape lack the long spines of the pecten extending to $3\frac{3}{5}$; this form may be a variety or subspecies, the larva being very similar to *pipiens*.

Distribution. TRANSVAAL: *un-published:* Tzaneen (De Meillon, 1926—1935), Magoeba's Kloof (C.S.I.R., 1953). CAPE PROVINCE: *un-published:* Embotyi (Lusikisiki district), Port St. Johns, Kologha Forest (Stutterheim district), Orange Kloof (Cape Peninsular), Fishhoek, Knysna district, Plettenberg Bay district and Coldstream (C.S.I.R., 1951 and 1952), Wynberg (Satchell, 1952), East London (van Rensen, 1952). NATAL: *published:* De Meillon (1943, p. 96) records the species breeding in tree holes, the locality was Eshowe (Zululand); *un-published:* Cathkin Park and Ingeli Forest (Harding district) (C.S.I.R., 1951 and 1954).

Culex (Culex) andersoni ssp. bwambanus Edwards (1941). (CR; p, rarely u).

Identification and taxonomy. Adults. — The shape of the style of the male terminalia and the hind femur being pale below on about the basal half, indicates this subspecies (De Meillon, 1943, p. 99). On some of the males the palpi are only as long as the proboscis or slightly shorter. The pattern on the scutum of both sexes is rather like *C. péringueyi* (fig. 1.c) but the pale scales are light brown or yellow instead of dull whitish. *Larva.* The presence of a sclerotic tooth near the apex of the siphon makes this larva easily distinguishable from other similar ones (Hopkins, 1952, p. 310).

Breeding places. In the Cape Peninsular this species was common in tree holes and also in pools; larvae were once collected from discarded tins.

Distribution. CAPE PROVINCE: *un-published:* French Hoek Forest Reserve (Harrison, 1952), Kirstenbosch and Westlake (nr. Muizenberg) (C.S.I.R., 1951). BASUTOLAND: *un-published:* Mamathes (Jacot Guillarmod, 1950). NATAL: *published:* Cathedral Peak (Drakensberg) (De Meillon 1943, p. 99); *un-published:* Inkuzi River (Waschbank) (Oliff, 1954), Olivier's Hoek Pass and Cathkin Park (C.S.I.R., 1954).

Culex (Culex) vansomereni ssp. **draconis** Ingram and De Meillon (1929). (R; p).

Identification and taxonomy. *Adults.* — From present evidence it seems that only this subspecies occurs in South Africa. The male terminalia are rather similar to *toroensis* and *terzii* (q.v.) but the projection of the outer division of *Ip.* of phallosome is less pointed (Edwards, 1941, p. 327). The scutal ornamentation of well marked specimens of this species, *trifilatus*, *toroensis* and *andersoni* ssp. *bwambanus* are rather similar, but on the latter it is more pronounced owing to the dark scales being darker than those of the other species.

Distribution. CAPE PROVINCE: *published*: Katberg (Edwards, 1941, p. 328); *un-published*: Kologha Forest (nr. Stutterheim) (C.S.I.R., 1951, or possibly *toroensis*, from a larva only). NATAL: *published*: Pietermaritzburg (Edwards, 1951, p. 328); *un-published*: N'Kandhla Forest (Zululand) (C.S.I.R., 1952).

***Culex (Culex) toroensis** Edwards and Gibbins, 1939. (R; p).

Identification and taxonomy. *Adults.* — As noted above the male terminalia are very similar to *terzii*, but the pre-alar scales of the pleurae are usually lacking on *toroensis*, but sometimes there are one or two scales below the pre-alar knob. One mount of male terminalia has the inner division of the lateral plate shorter than the outer, like *C. striatipes*, but there are no post spiracular scales as has *striatipes*.

Distribution. TRANSVAAL: *un-published*: Magoeba's Kloof (C.S.I.R., 1953), from a female and associated pelt. NATAL: *un-published*: Pietermaritzburg (De Meillon, 1927), Newcastle district, Olivier's Hoek Pass (Drakensberg) and Ingeli Forest (Harding District) (C.S.I.R., 1951—1954).

***Culex (Culex) chorleyi** Edwards (1941). R; p).

Identification. *Adults.* — The terminalia of three males from the Cape Province appear to be quite typical.

Distribution. Port St. Johns (Transkei) (C.S.I.R., 1952).

Culex (Culex) antennatus Becker, 1903. (R; p).

Biting habit. De Meillon (1947, p. 116) notes that this species was caught in native huts in Bechuanaland and was taken biting in the forest in the evening and afternoon.

Distribution. BECHUANALAND: *published*: Kasane, Muhembo and Maun (De Meillon *loc. cit.*). NATAL: Ingram and De Meillon (1927, pp. 41—45) list four localities on the coastal belt of the province, under *C. laurenti* Newstead. I have checked the terminalia of a male from this collection, but it is not certain from which locality.

Note: A record for Johannesburg (Rae, 1946) is based in females only and requires confirmation.

Culex (Culex) decens Theobald, 1901. (CR; p, rarely t, u).

Distribution. S. W. AFRICA: *published*: Okarogawe Spring (? Okorosawe Spring) (De Meillon and Lavoipierre, 1944, p. 57), Otjimbingwe (De Meillon and Hardy, 1953, p. 32); *un-published*: Okahandja (Murray, 1942). TRANS-VAAL: *published*: Princes Hill, Mokeetsi, Tzaneen and Brits (Ingram and De Meillon, 1927, pp. 18—19 and 1927 pp. 140—141), Onderstepoort and Witbank (Bedford, 1928, p. 976); *un-published*: Duivels Kloof (De Meillon, 1926—1935). CAPE PROVINCE: *un-published*: Port St. Johns (C.S.I.R., 1952). NATAL: *un-published*: Eshowe (De Meillon, 1926—1935), Umbilo (nr. Durban) (Bevis).

***Culex (Culex) trifolius** Edwards, 1914. (R, p).

Identification and taxonomy. *Adults.* — The male terminalia are typical, but the secondary leaflets on the lobe of the coxite sometimes appear to be rather narrow, probably owing to being folded or turned sideways. Four males and a female from the South Coast of Natal have broadish basal white bands on some or all of the abdominal tergites. *Larva:* This has not been described. It would appear to come nearest to *C. decens* and *C. wigglesworthi* (Hopkins, 1952, pp. 261 and 320) which have long 2-branched plumose head setae B and C, and a long siphon with short sub-ventral tufts. From the latter it can be distinguished by the fewer and longer denticles on the pecten spines and no median tufts outside the barred area; from the former also by the longer denticles of the pecten spines and the longer sub-ventral tufts of the siphon. In the key of Hopkins 1952, p. 246) it runs down to *tritaeniorhynchus* (section 56) from which it differs in the fewer denticles on the pecten spines, shorter sub-ventral tufts, and the apical bend of the siphon. Only *decens* occurs in southern Africa. *Head:* Setae A: 6-branched, B and C: 2-branched, plumose and about length of head, *d*: long, single and simple. *Mentum:* with about 10 teeth on each side. *Abdomen:* comb, a patch of 35—40 pale scales of about equal size. *Siphon:* index about 10 (un-mounted) slightly bent towards dorsal side at apex, with apparently five pairs of 2—3 branched simple sub-ventral tufts which are about the diameter of the siphon in length. *Pecten:* 11 and 12 pale spines on basal 1/3 or less of siphon (distal one wider spaced on one side), each with 3 or 4 long denticles on the ventral side similar to those of *C. univittatus* (Hopkins, 1952, p. 292). *Ventral brush:* 10, 6—8-branched tufts none of which are outside the barred area.

Breeding place. Described from one associated pelt of a male bred out from larvae collected from a rock pool in a river bed at Amanzimtoti (Natal); another male was bred from a larva from a slow-flowing swampy stream, and the series of Ingram and De Meillon were from pools in a tributary of the Pongola River.

Distribution. S. W. AFRICA: *published*: Karabib (De Meillon and Hardy 1953, p. 32). NATAL: *un-published*: Pongola Poort (Candover district) (Ingram and De Meillon, 1927), Amanzimtoti (South Coast) (C.S.I.R., 1950 and 1951).

Doubtful records.

Culex (Culex) thalassius Theobald, 1902.

Identification. In 1942 I collected larvae at St. Lucia (Zululand) which appeared to belong to this species and Dr. Steyn has informed me that he has also collected these larvae in Natal. I am, however, loath to add it to the list until it has been confirmed from male terminalia. It is not known if Bedford's record (1928, p. 970) really refers to this species.

Disease transmission. Kerr (1932) has shown that females are able to transmit yellow fever by bite.

Key to the adults and synopsis of ornamentation.

The first part of this key is intended for the identification of species with easily recognisable features, mostly ornamentation which can be seen with a hand lens. When two or more species are given together, determinations should be confirmed from male terminalia for accurate records. The descriptions of Edwards (1941) and later publications should also be consulted, as full details of ornamentation etc. are not given. To use the key the specimen should be compared with the main sections until one is found with which it agrees, then the subsections a, b, c, d etc. are followed to indicate the species or group. Light or dark brown unspeckled species without any other distinctive ornamentation, apart from abdominal markings, are divided into groups in the second part, for final determination from male terminalia. For these the key should be entered at that stage, but it must be borne in mind that some specimens may appear to have no markings, particularly on the scutum, owing to the scales being rubbed off, and the pale stripes on the mid and hind tibiae of a species such as *Culex univittatus* may not always be easily noticed.

Part. I. Ornate, speckled or well marked species.

Part II. Light or dark brown species without distinctive ornamentation on head, thorax or legs, or with only an indefinite pattern on the scutum, and sometimes femora and tibiae white-tipped.

Part. I.

Section A — Tibiae either speckled with pale scales, or with rows of pale spots, pale blotches, or with three or more incomplete white rings; tarsi with or without pale bands.

Section B (p. 194) Tibiae not speckled with pale scales etc., either all dark or with one or more complete pale bands, or white-tipped,* or with other markings; some tarsal segments either with pale or dark bands, or other pale and dark markings.

Section C (p. 197) As B, but tarsi either all dark or all pale.

* If tibiae are all dark or only pale-tipped the specimen has other distinctive marking for part I of the key.

Section A.

1. A smallish species having a conspicuously mottled appearance of dark greyish brown, white, and some yellow scales; proboscis with two (rarely three) broad white bands, one in the middle and one at tip (a third sometimes near base); there are white bands on the tarsi which embrace or overlap the joints, and some of the dark scales on the middle femur and hind legs are semi-erect *Aëdomyia fufjurea*.

2. Smallish or medium-sized dark brown or blackish species, proboscis with one broad well defined white band in middle, wings speckled or with scattered pale scales, femora, tibiae and first tarsal segment of legs speckled, but tibiae without rows of white spots in front; hind tarsi with basal white bands, and scutum with an indefinite pattern of dark scales and brown or yellowish scales.

(a) Abdominal tergites with a sprinkling of yellow scales, on a dark ground, with usually some short or long basal white bands on some or all segments, and white sub-lateral patches; also a broad median white band on the eighth segment (above)
Aedes (Diceromyia) jurcifer, A. (D.) taylori.

(b) Abdominal tergites with scattered buff-coloured scales, and broad apical buff-coloured bands, which are widest laterally, white bands of tarsi slightly overlapping the joints . . . *Culex (Culex) ethiopicus*.

(c) Tergites without sprinkling of pale scales, but with median basal triangular white patches and apical lateral white patches
C. (C.) annulioris

3. Medium-sized dark brown or blackish species, proboscis with one well-defined white band in the middle, wings dark, and either femora and tibiae sparsely speckled, or with several white spots in a row anteriorly, tarsi with narrow basal white bands.

(a) Tibiae with spots in a row in front
Culex (Culex) poicilipes.

(b) Tibiae sparsely speckled and abdominal tergites either with apical lateral patches of buff or orange scales, or usually distal three or four segments entirely covered with these scales above and below . . .
C. (C.) aurantapex.

4. Smallish, medium-sized, or fairly large brown or blackish species, proboscis without a well-defined white band in middle, but not all dark, either mostly palish or with some pale scaling in middle (sometimes beneath); femora, tibiae and first tarsal segment either speckled, or femora with irregular marking (or bands) and tibiae with rows of whitish blotches; most tarsi with broad or narrow white bands.

- (a) Fairly large species, all tibiae with a white band in the middle . . .
Taeniorynchus uniformis, *T. africanus*.
- (b) A fairly large species, wing nearly all dark except for a white line
on distal part of costa
Aëdes (Aëdimorphus) hirsutus.
- (c) A smallish species with abdominal tergites having smallish median
basal white patches, small sub-basal white patches, and scattered
white scales on black ground
Aëdes (Diceromyia) adersi.
- (d) A medium sized species, tergites with whitish basal bands and buff
apical lateral patches, which sometimes nearly join on the apical
edges of the segments
Aëdes (Aëdimorphus) durbanensis.
- (e) A medium-sized species, tergites with basal white bands and white
patches down lateral sides
A. (A.) fowleri.
5. Medium-sized or large brown or dark brown species, proboscis all dark,
femora speckled or spotted, tibiae either speckled in front (pale or dark
behind), or with a line of pale spots or blotches (in front); tarsi with broad
or narrow basal pale bands on most segments.
- (a) A large species with a row of spots or blotches on the tibiae (in
front), anterior side of costa (of wing) whitish, and aggregations
of scales on wing forming darker spots (Edwards, 1941, p. 69) . . .
Theobaldia (Allotheobaldia) longiareolata.
- (b) A medium-sized species, tibiae speckled anteriorly, front and middle
tibiae pale behind, wing usually nearly all dark, often with a short
pale line at base of costa; abdomen predominantly pale-scaled with
lateral dark patches on the tergites; scutum covered mostly with light
brown scales
Aëdes (Ochlerotatus) caballus.
6. Medium-sized species, proboscis either dark or speckled as also palpi and
wings; femora, tibiae and first (and often second) tarsal segments speckled,
but tarsi without pale bands and tibiae without rows of spots.
- (a) Wings and usually palpi and proboscis un-speckled
Aëdes (Ochlerotatus) harrisoni.
- (b) These parts (a, above) speckled
A. (O.) breedensis.
7. A large brown species with dark proboscis, dark wings, spotted or speckled

femora and rows of pale spots on the front and middle tibiae (anteriorly), usually these spots running together on the hind tibiae; tarsi un-banded except sometimes narrowly at base of first segment on hind leg

Culex (Lutzia) tigripes.

8. Medium-sized blackish species, proboscis with some pale scales, but un-banded, femora and tibiae speckled and with white bands on the tarsi, some of which embrace the joints

Orthopodomyia sp. (undescribed).

Section B.

1. A very large mosquito, legs blackish with blue or violet sheen, scutum with peacock green or bluish scales, peacock blue scales on the abdominal tergites and white scales on the pleurae; second segment of all tarsi with more than the basal $\frac{1}{2}$ white, and first segment of middle tarsi broadly white at base

Toxorhynchites brevialpis.

2. A very large mosquito with light grey, light brown and white marking, and having a "mouldy" appearance, owing to many of the scales on the thorax, legs and abdomen being erect or semi-erect.

(a) Front tibia with three white bands of about equal breadth, at base, middle and tip, with grey scaling in between.

Aedes (Mucidus) scatophagoides.

(b) Front tibia with apical $\frac{1}{3}$ or more white, and a narrow white band at base

A. (M.) mucidus (? variety).

3. Fairly large species with whole integument and scaling predominantly yellow, and with broad or narrow black banding on the legs, or with the thoracic integument dark reddish brown or pale green.

(a) Thoracic integument golden yellow, hind tarsi with broad apical black bands, hind tibia with a black band in middle and at tip, in addition to black marking on other legs

Taeniorhynchus (Coquillettia) aureus,

T. (C.) wahlbergi.

(b) Thoracic integument yellow, but hind tibia without black bands, and tarsal segments usually with tips only dark

T. (C.) microannulatus.

(c) Thoracic integument dark reddish brown, legs as in (a)

T. (C.) fuscopennatus.

(d) Thoracic integument pale green, scutum with pale yellowish scales, hind legs as in (a)

T. (C.) maculipennis.

4. A small species with dark brown and yellowish markings, wings speckled, first hind tarsal segment with basal, mid and apical yellow bands, second and third segments with apical yellow bands only; abdomen with a broad dorsal median yellowish band for most of its length

Ficalbia (Etorleptomyia) mediolineata.

5. Medium-sized species, ground colour sooty black, with or without bronzy, or violet sheen, wings and tibiae un-speckled, white basal bands on at least first two segments of hind tarsi in addition to other white, silver or yellow ornamentation. The tarsal bands do not embrace the joints and that on the second segment of the hind legs is not markedly broader than on the first . .

Aedes (Stegomyia) spp.

Aedes (Finlaya) nyasae.

Note. Keys to the *Stegomyia* species are in a separate publication (Muspratt, in the press). *Aedes (Finlaya) nyasae* will also run down to this section, but the scutal ornamentation is different to all the stegomyias, and the fifth tarsal segment of the middle legs is usually all (or nearly all) whitish.

6. Medium-sized dark brown species with white or creamy bands on tarsi of all legs, most of which embrace or overlap the joints.

- (a) Proboscis with a broad pale band in middle, femora and tibiae un-speckled and middle tibiae with a pale line in front

Culex (Culex) duttoni.

- (b) Proboscis all dark, femora and tibiae un-speckled and white patch at apex of hind tibiae as long as broad

Aedes (Aedimorphus) lamborni.

7. Medium-sized species, ground colour blackish with slight or pronounced violet sheen, with a white band on second hind tarsal segment extending to beyond half, or if shorter than this, then there is a band on the first segment which is shorter than that on the second.

- (a) Pale markings metallic silver, scutum with a double median line separating round pre-scutellar bare space

Aedes (Finlaya) fulgens.

- (b) Scutum with black and yellowish stripes forming four broad dark areas, white band on second segment of hind tarsi about $\frac{1}{2}$ length of segment

A. (F.) barnardi.

- (c) Scutum without yellow stripes, female palpi with a white band in middle, male palpi with 4 white bands, second segment of hind tarsi with white band shorter than $\frac{1}{2}$ but longer than that on first segment

Aedes (Diceromyia) fascipalpis.

8. Medium-sized dark brown or blackish species with broad apical bands on segment 1—4 of the hind tarsi (fifth white).

- (a) A pair of snowy white patches of broad scales in front of scutal angles and a pair of sub-lateral white patches in middle of scutum; femora with white pre-apical spots (in front) as well as white tips . .

Aedes (Aedimorphus) marshalli.

- (b) Similar to (a) but with a pair of broadish white bands on anterior lateral margins of scutum running past scutal angles and no pre-apical white spots on femora, although there is sometimes a pale patch or streak in the middle of the middle femur; second segment of front and middle tarsi not white tipped

A. (A.) capensis.

- (c) Scutum similar to (b) but without the pair of sub-lateral white patches, no preapical white spots on femora, and second segment of front and middle tarsi white tipped

A. (A.) haworthi.

9. A medium-sized dark brown species, femora speckled (sometimes sparsely), tibiae with narrow basal white bands, middle and hind tibiae narrowly pale at tip, front tibia with a pale patch at tip in front; most tarsal segments with pale basal bands; male palpi with a white band on the middle of the shaft, and white patches at the base of each segment (above)

Aedes (Aedimorphus) vexans.

10. Small dark brown species with a streak of bluish white scales on the scutum in front of wing root, and bluish scales on the head, tarsi with some pale markings.

- (a) Hind tarsi with white bands embracing joints of segments 1—2 and 2—3 and more than the last two segments entirely white; abdominal tergites with short apical white bands

Uranotaenia montana.

- (b) Hind leg as (a) but pale bands less distinct, tergites un-banded . .

U. bilineata var. *fraseri.*

11. A small dark brown species with distal two segments (or more) of fore and middle legs whitish, tip or nearly all of third hind tarsal segment white, and last two segments also white; abdominal tergites with apical pale bands . .

U. candidipes.

12. A fairly large dark brown species with proboscis pale beneath to beyond $\frac{1}{2}$, or a narrow pale band in middle; narrow pale basal bands on the first two tarsal segments of all legs, last two segments of hind legs all white and usually distal part of third segment; abdominal tergites with basal white bands and lateral white patches; venter pale

Ficalbia (Mimomyia) plumosa.

13. A small dark brown species with a patch of broad pale yellow scales on the vertex and a mottled pattern of pale and brown scales on the scutum; last two segments of hind legs indistinctly pale (above) and usually distal part of third segment; abdomen with basal pale bands

Ficalbia (Mimomyia) mimomyiaformis.

Section C.

1. A fairly large darkish species with the scutum covered in yellowish or whitish scales, tibiae and tarsi all dark, but leg scales and the dark ones on the abdominal tergites have a distinct violet or purple sheen, abdominal tergites un-banded, but with basal lateral pale patches.

Taeniorhynchus (Coquillettia) metallicus.

2. Fairly large species with thoracic integument usually pale yellow, and with yellow, black and silver ornamentation; there is a broad stripe of metallic silvery scales right across the pleurae, including *apn* and the middle of the mesepimeron; also silver scales on head, and diagonal lateral silvery patches on the dark abdominal tergites.

- (a) Scutum with a pattern of narrow yellow and blackish scales, consisting of a rather narrow yellow margin and five longitudinal yellow stripes, with five almost separated dark areas

Eretmapodites quinquevittatus.

- (b) Scutum with a yellow margin and one narrow median yellow line with a dark line each side of it, but dark scales on rest of scutum rather scanty

E. silvestris.

- (c) Scutum with black and yellow scales mixed but with no definite pattern

E. subsimplicipes.

3. Medium sized to fairly large brown or yellowish species with a broad or narrow pale stripe running down front of middle or hind tibia for all or most of its length. On three of the species there is a similar pale stripe on the middle of the middle femur (in front) and usually on both the middle and hind tibiae (in front).

- (a) Proboscis mostly pale except at tip, tarsi pale yellowish and also the costa and some wing veins; broad pale stripes on middle and hind tibiae (in front) and an anterior pale stripe on the middle femur

Aedes (Aëdimorphus) ochraceus.

- (b) Scutum with a pattern of five longitudinal narrow white lines on a dark ground, two of which are near the lateral margins, abdominal tergites with narrow incomplete apical pale bands

Culex (? *Neoculex*) *pulchrithorax* (one form).

- (c) Proboscis usually palish beneath, narrow pale stripes on all tibiae anteriorly (that on front tibia often a broken line) and a dark antero-ventral stripe on less than distal $\frac{1}{2}$ of hind femur (in front) with also a dark dorsal stripe
Culex (Culex) theileri.

- (d) Narrow anterior pale stripes on middle and hind tibiae (usually abbreviated distally) and on middle femur; dorsal $\frac{1}{2}$ and tip of hind femur dark, but no antero-ventral dark stripe distally . . .
Culex (Culex) univittatus.

- (e) A faint anterior pale stripe on middle tibia, but middle femur and hind tibia dark anteriorly except at tip
Culex (Culex) striatipes ssp. *joanae* (one form).

4. A medium sized dark grey or blackish species with a long slender dark proboscis, a pair of fairly large irregular patches of narrow white scales on the scutum in front of wing roots, and pleurae extensively covered with broadish white scales; hind femur nearly all white (in front), tarsi dark; abdominal tergites with large lateral white patches, and usually basal white bands on segments 5—7; venter mostly white except for the distal three segments . .
Aedes (Dunnis) natalensis.

5. Medium sized species, ground colour blackish, legs unspeckled and unbanded, scutum bordered laterally by a broad yellow or yellowish white margin, with sometimes a pair of broad or narrow median yellow stripes.

- (a) Scales on broad lateral margin of scutum and on head yellow, first and fifth wing veins yellow scaled to near tip and some pale scales on forked veins
Aedes (Banksinella) luteolateralis.

- (b) Yellow scales on scutum and head as in (a) but first and fifth wing veins pale basally at most to middle of wing; venter mainly dark . .
A. (B.) lineatopennis.

- (c) As in (b) with pale yellow scutal scales, but no pale scales on forked veins of wing, and venter almost all yellow scaled
A. (B.) circumluteolus.

- (d) As in (c) but venter dark, and pale scales on head, scutum and wings white or yellowish (first and fifth veins of latter white basally to middle)
A. (B.) albothorax.

6. A smallish dark brown species with metallic silvery markings and dark legs; proboscis short, swollen distally, and with an upward bend (Edwards, 1941, p. 34), also pale on basal $\frac{1}{2}$ or more; scutum with a double median line of flat silvery scales from anterior margin to beyond middle; *apn*, *ppn*, and

parts of pleurae covered with silvery scales (less bright on *ppn*); large silvery apical patches on abdominal tergites except on segment 3

Harpagomyia taeniarostris.

7. Smallish dark brown species with two pairs of sub-lateral snowy white spots of broadish scales on scutum, one pair near front margin and the other pair near the middle; tarsi all dark.

- (a) Middle and hind femora with white pre-apical spots (in front) as well as white at tip

Aedes (Aedimorphus) argenteopunctatus.

- (b) As (a) but without the pre-apical white spots on middle and hind femora

A. (A.) mixtus, *A. (A.) microstictus*, *A. (A.) bedfordi*.

8. Medium sized brown or dark reddish brown species with two pairs of white or dull yellow spots on the scutum as previous group, but these consisting of narrow scales only, and two species have additional small pale spots and pale scales; tarsi dark.

- (a) An additional pair of small white or dull yellow spots on scutal angles and above wing roots, also some pale scales on anterior edge and a patch of broad or broadish white or pale scales on the paratergite

Aedes (Aedimorphus) filicis, *A. (A.) minutus*.

- (b) Without any scales on the paratergite or additional pale spots or pale scaling on the scutum

Culex (Culex) argenteopunctatus ssp. *kingi*.

9. Small dark brown species with either a streak of bluish white scales on the scutum, in front of wing root, and bluish scales on the head, or with bluish scales on the head only; tarsi dark.

- (a) Wing dark and short apical creamy bands on tergites 2 and 4; tarsi dark

Uranotaenia alba.

- (b) Bluish white scales on basal part (stem vein) of vein 1 of wing, and on base of vein 5; tarsi dark

U. balfourii.

- (c) No bluish white streak on scutum in front of wing root, but with bluish scales on vertex; tarsi dark

U. chorleyi.

10. Small dark brown species with pale pleurae, and with a black spot on the scutal integument above the wing root; tarsi dark

Uranotaenia mashonaensis, *U. nigromaculata*.

11. Small brownish species with yellowish or brown pleural integument and conspicuous broad pale yellow scales on the head; tarsi dark.

- (a) Scutal integument brown, pleural integument pale yellow, abdominal tergites with no median pale patches

Ficalbia (Mimomyia) hispida.

- (b) Scutal and pleural integument darker, with small median basal pale patches usually on segments 2—7

F. (M.) lacustris.

12. Small or medium sized dark brown species with either a scutal pattern of five white longitudinal lines on a dark ground, two of which are near to the lateral margins (Edwards, 1941, p. 254) or a pattern like, or similar to, that shown in fig. 1,c; tibiae and tarsi all dark; abdominal tergites with narrow pale apical bands or small apical lateral white patches.

- (a) Scutal pattern of five white lines, as noted above, femora white tipped and abdominal tergites with narrow incomplete apical pale bands .

Culex (? Neoculex) pulchrithorax (one form).

- (b) Scutal pattern of whitish scales as fig. 1,c, femora white tipped and abdominal tergites with more or less complete apical white bands .

C. (N.) péringueyi.

- (c) Scutal pattern rather similar to (b) (De Meillon 1943, p. 97), femora not white tipped, and abdominal tergites with rather small apical lateral white patches only

C. (N.) avianus.

13. Medium sized brown or dark brown species, with a faint pattern on the scutum rather similar to *C. péringueyi* (fig. 1,c), but pale scales of latter light brown or yellowish; femora and tibiae white-tipped and abdominal tergites usually with basal pale bands.

some *Culex* and *Aedes* (*Aëdimorphus*) spp. (see part II below).

Part II.

1. Fairly large brown species with broad or broadish pale scales on the paratergite; abdomen with or without basal pale bands; all have post-spiracular scales and all have a large patch of sub-spiracular scales, with an additional small patch on some of the species. Identification should be made from male terminalia

Aedes (Aëdimorphus) albocephalus, *A. (A.) eritreae*,

A. (A.) alboventralis, *A. (A.) leesoni*, *A. (A.) quasiunivittatus*,

A. (A.) dentatus, *A. (A.) pachyurus*, *A. (A.) subdentatus*,

A. (A.) cumminsi, *A. (A.) bevisi.*

2. Small brown species with palish pleurae, vein 6 of wing bending down to lower margin about opposite fork of vein 5; tibiae and tarsi dark.

(a) A dark spot on scutal integument above wing root
Uranotaenia mashonaensis, *U. nigromaculata*.

(b) Without a dark spot on scutum
U. fusca.

3. A small species with palish pleurae and without acrostichal bristles or a lower mesepimeral bristle, and with basal lateral white spots on the tergites; male palpi much shorter than proboscis and of a peculiar form (Edwards, 1941, p. 269)
Culex (Neoculex) horridus.

4. Small or medium sized species with palish pleurae, tibiae and tarsi dark and apical white bands (or apical lateral white patches) on the abdominal tergites.

(a) No post spiracular scales, but pre-alar scales present
Culex (Neoculex) salisburyensis.

(b) Few or no pleural scales, but with two dark bands running across the pleural integument
C. (N.) rima, *C. (N.) insignis*.

5. Small dark grey or brown species with no post-spiracular or pre-alar scales, tibiae and tarsi dark; abdominal tergites either all dark or with only indistinct apical lateral pale spots.

(a) With one lower mesepimeral bristle
Culex (Culiciomyia) nebulosus and var. *pseudocinereus*,
C. (C.) cinerellus, *Culex (Mochthogenes) inconspicuus*,
C. (M.) simpliciforceps.

(b) A reddish brown species with few or no pleural scales and without a lower mesepimeral bristle
Culex (Neoculex) rubinotus.

6. Smallish species with usually un-banded abdominal tergites, but with basal lateral pale spots (or patches) on some or most segments; tibiae dark or with small pale spots at tips; tarsi dark; no post-spiracular or pre-alar scales . . .
Culex (Culex) antennatus, *C. (C.) decens*, *C. (C.) trifolius*
(typical form).

7. Medium sized or fairly large light or dark brown species, with pale or dark pleurae; proboscis all dark or palish in middle (beneath), hind tibiae pale tipped; abdominal tergites with basal pale bands and usually, but not always, with lateral pale patches also.

- (a) With both post-spiracular and pre-alar scale patches
Culex (Culex) simpsoni, *C. (C.) striatipes* ssp. *joanae* (one form).
- (b) No post spiracular scale patch, but pre-alar scales present
C. (C.) terzii, *C. (C.) zombaensis*, *C. (C.) vansomereni* ssp. *draconis*.
- (c) No post-spiracular or pre-alar scales
C. (C.) pipiens, *C. (C.) fatigans*, *C. (C.) trifilatus*,
C. (C.) andersoni ssp. *bwambanus*, *C. (C.) toroensis*,
C. (C.) chorleyi, *C. (C.) trifoliatus* (S. A. form).

Locality List.

The less well-known localities are listed below in alphabetical order, together with some of the principal localities where the writer has made collections and special investigations during the last four years. The latter are marked with an asterisk and the numbers are shown encircled on the map (fig. 2). Numbers relating to the other localities are not encircled unless they coincide with an encircled area, in which case they have the same number. The map numbers read from north to south except when they fall on about the same latitude, when they are taken from west to east.

S. W. AFRICA.

Auchab Drift (5), Brandberg (7), Epukiro (12), Franzfontein (6), Gobabis (15), Karabib (Karibib) (13), Namutoni (4), Okakarara (9), Okorosawe Spring (3), Okimbahe (10), Omajette (8), Omaruru (11), Ondangua (1), Oshikango (1), Otjimbingwe (14), Runtu (2), Usakos (13).

BECHUANALAND PROTECTORATE.

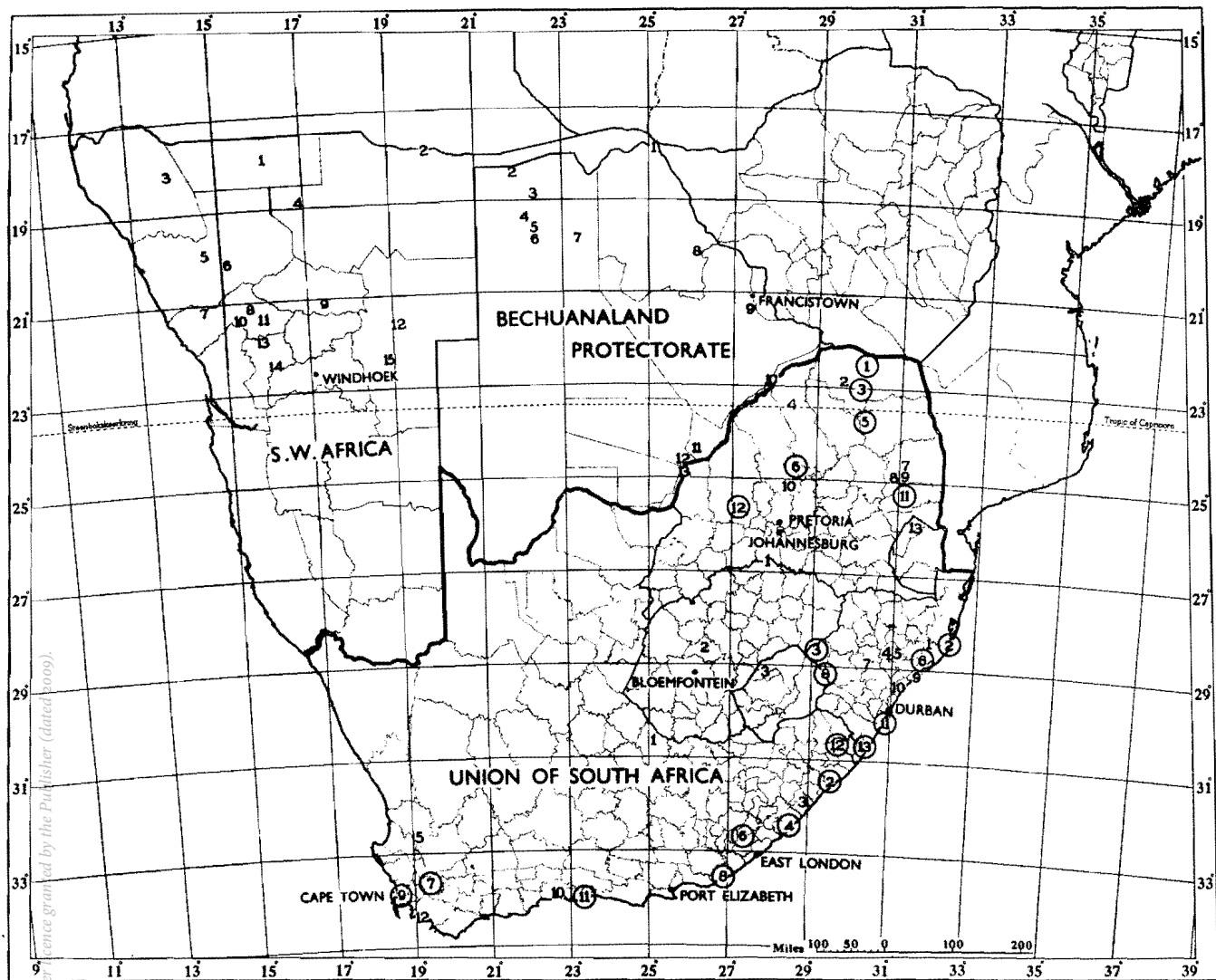
Basinghall (10), Chobe Rapids (1), Gaberones (12), Gomare (4), Kasane (1), Martin's Drift (10), Maun (7), Mochudi (11), Muhembo (Mohembo) (2), Nata (8), Nokonen (Nokanen) (5), Ramoutsa (13), Seronga (3), Shashi (9), Xwe (Boajankwe) (6).

TRANSVAAL (and Swaziland).

Baltimore (4), Bushbuck Ridge (9), Chipise (1), Duivels Kloof (5), Elim (3), Havelock Mine (13), Horo (13), Krokodilpoort (11), *Louis Trichardt (3), *Magoeba's Kloof (5), *Messina (1), Mokeetsi (5), Naboomspruit (6), New Agatha (5), *Nylstroom (6), Pienaar's River siding (10), Pilgrim's Rest (8), Prince's Hill (2), Rolle siding (7), *Rustenburg (12), Sabie River (Bungalow Hotel) (11), *Warmbaths (6), *White River (11), Wylie Poort (Wyllie's Poort) (3).

Fig. 2. *Locality Map.*

Map of the Union reproduced under the Government Printer's Copyright Authority No. 2149 of 31/8/54.



CAPE PROVINCE.

*Cape Town (9), Citrusdal (5), Coldstream (11), Colesberg (1), Durbanville (9), Elsenberg (9), *Embolyi (2), *Groot Rivier (Nature's Valley) (11), Kaaibmans Gat (10), *Kologha Forest (6), *Knysna (11), *Manubie Forest (4), *Mazeppa Bay (4), M'Kanduli (Mqanduli) (3), Palmiet River (12), *Port Alfred (8), *Port St. Johns (2), Qolora (4), *Worcester (7), Schuster's River (9).

ORANGE FREE STATE (and Basutoland).

Brandfort (2), Mamathes (3), Vaal River Barrage (1).

NATAL.

*Amanzimtoti (11), *Cathkin Park (8), *Dukuduku Forest (2), *Impetyeni Forest (12), *Ingeli Forest (12), Keate's Drift (7), *Margate (13), Manyana (4), Melville (13), Mhlatuse (Mhlatuze) (6), *Mtunzini (6), Nkandhla Forest (5), Nkwalini (6), Ntambanana (6), Nyezane (9), *Olivier's Hoek Pass (3), Oribi Gorge (13), *St. Lucia (2), St. Winifreds (11), Salt Rock (10), South Broom (13), Sunwich Port (13), Ulundi (1), Umhlatusi (6), Umtentweni (13).

Summary.

The distribution is given, with notes on taxonomy and bionomics, of 105 culicine species and one of the genus *Toxorhynchites*, which occur in South Africa and the neighbouring territory, of South West Africa and the Protectorates of Bechuanaland, Swaziland and Basutoland. The culicine species comprise ten genera and seventeen sub-genera. A list of 17 species of the sub-genus *Stegomyia* is included, but this sub-genus is otherwise dealt with in a separate paper (in the press). As a guide to the identification of adults a key or synopsis of ornamentation and other characters is appended, and also an alphabetical list of the less well-known localities and areas where the writer has made special investigations. These places are indicated on a map-figure.

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